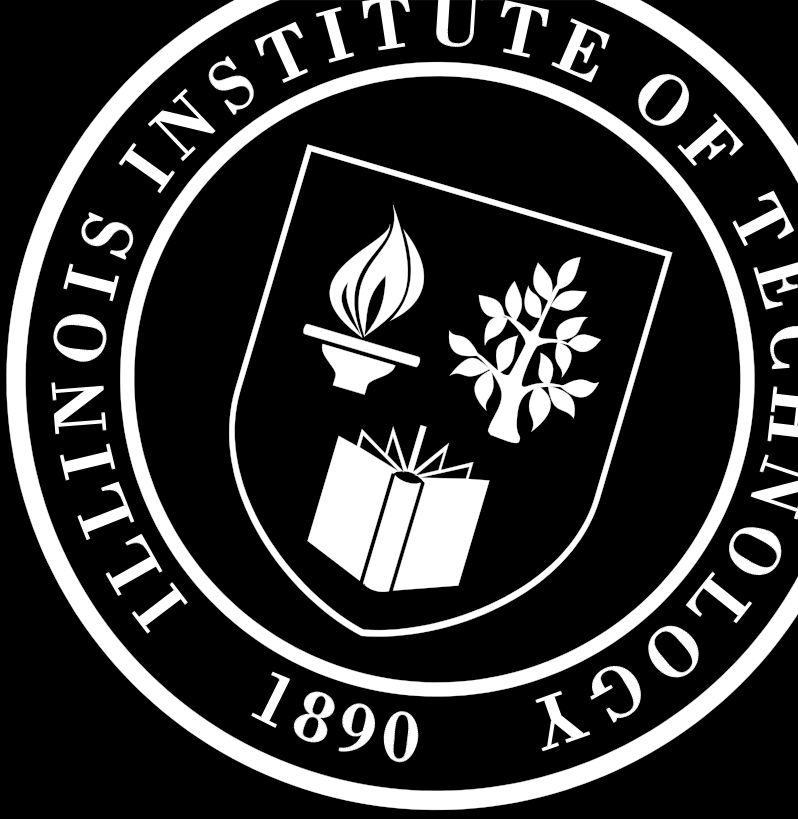

1993-1995 Bulletin of Undergraduate Programs

Illinois Institute of Technology

TABLE OF CONTENTS

ILLINOIS INSTITUTE OF TECHNOLOGY
1993-95

Main Campus
3300 S. Federal Street
Chicago, Illinois 60616-3793
312/567-3000

Downtown Campus
565 West Adams Street
Chicago, Illinois 60661-3601
312/906-5000

Daniel F. and Ada L. Rice Campus
201 East Loop Road
Wheaton, Illinois 60187-8489
708/682-6000

Moffett Campus
6502 South Archer Avenue
Argo-Summit, Illinois 60501-1933
708/563-1576

Illinois Institute of Technology
Bulletin
Undergraduate Programs 1993-1995
Engineering/Science/Business
Architecture/Design/Liberal Arts

It is the intention of Illinois Institute of Technology to act in accordance with all regulations of the federal, state, and local governments in respect to providing equality of opportunity in employment and in education, insofar as those regulations may pertain to IIT. IIT prohibits and will act to eliminate discrimination on the basis of race, color, sex, religion, national origin, age, veteran status, or handicap.

Any student, applicant, or employee of Illinois Institute of Technology who believes that he or she has received inequitable treatment because of discrimination violating IIT's stated policy of equal opportunity in employment and in education should communicate, either in writing or in person, with the Vice President of

Multicultural Programs, Room 224, Perlstein Hall, Illinois Institute of Technology.
For descriptions of graduate programs and courses, see the IIT Bulletin: Graduate Programs. For descriptions of law programs and courses see the Chicago-Kent College of Law Bulletin.
Note: The information in this Bulletin is subject to change without notice. Changes will be duly published.

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Letter from the President
Dear Student:

Illinois Institute of Technology is committed to providing undergraduate education of the highest quality. We believe that every one of our students has the ability to make significant contributions to society. Our goal is to help you attain the knowledge, skills, ethical perspective, and motivation you will need to realize that potential.

Our university is especially well-suited to prepare you to seize the opportunities and address the real problems of a rapidly changing, increasingly complex world. The IIT scholars with whom you will study contribute to the nation's intellectual wealth in areas ranging from ethics and management to design processes, mathematical problems, and theoretical physics. Our multicultural student body and our location in the heart of one of America's most ethnically diverse cities make the undergraduate experience an ideal way to prepare for tomorrow's global society.

As the midwest's largest private center for applied science and engineering research, we also develop new processes and technologies that fuel the nation's economy. Together with our research institute, IITRI, we are a national resource for an amazing variety of industrial and government research projects, from electromagnetic compatibility analyses to environmental cleanup. Research activity enhances teaching at IIT. It sparks new courses and academic programs, and it creates new opportunities for undergraduate projects and for undergraduate participation in faculty research.

This Bulletin describes the range of academic opportunities IIT offers. But academics are only part of the college experience. Participating in campus organizations, activities, and special interest groups will introduce you to new ideas as it helps you develop leadership and teamwork skills.

As we look toward the 21st century, we hold fast to the qualities on which our past successes have been built: small size, solid curriculum in liberal arts and technology, private funding, superior students and faculty, and metropolitan location.

I encourage you to take full advantage of what this university has to offer.

Sincerely,
Lewis Collens

THE UNIVERSITY

The Objective of Education at IIT

Illinois Institute of Technology is a private, doctoral-degree-granting university for technology and the professions. Now in its second century, IIT continues to build on its distinguished heritage, national reputation, and ability to offer excellent educational programs in science, engineering, design, architecture, law, and business.

IIT teaching and research programs have this mission: to advance the frontiers of knowledge and to develop able professionals who will become vital contributors to the 21st century, both in their careers and in society at large. All academic programs at IIT combine in-depth learning in a major field, practical experience, and broad exposure to other disciplines.

Faculty members and students form a community of scholars. The professor's primary role is to help develop students into professionals; the student's responsibility is to participate fully in the academic community and to take advantage of the general and professional education offered. The unique freshman seminar, HAWK, brings students and senior faculty members together each week in small problem-solving groups, helping students get to know their advisers as both teachers and mentors. Because faculty members in all of IIT's colleges and schools are actively involved in research, many students have an additional opportunity to work directly with them on projects.

At IIT, quality education means small classes, personal attention, challenging curricula, and diverse opportunities.

The Setting

IIT's traditions span more than a century of innovation and educational leadership. IIT came into being in 1940 with the merger of Armour Institute of Technology (1890) and Lewis Institute (1896). Today, IIT offers undergraduate and graduate programs through the Institute of Design and six colleges and schools: Armour College of Engineering and Science; Lewis College of Liberal Arts; College of Architecture (1938); Institute of Design (1949); Stuart School of Business (1969); the Graduate School; and Chicago-Kent College of Law (1969).

Midwest College of Engineering (1967) joined the university in 1986, forming the nucleus for IIT's west suburban campus. IIT Research Institute (IITRI) is the university's contract research affiliate. Together IIT and IITRI form the midwest's largest private center of applied science and engineering research. Headquartered on the IIT Main Campus, IITRI also operates facilities at 24 sites throughout the country.

The 120-acre Main Campus is located in Chicago, a city rich in cultural and other resources for scholarship and research. The campus is easily accessible by public transportation, and a shuttlebus provides transportation between the Main and Downtown campuses. The master plan of the Main Campus and many of its 50 buildings were developed by Ludwig Mies van der Rohe, one of the century's most influential architects and, for 20 years, the chairman of IIT's Department of Architecture.

IIT's Downtown Campus at 565 W. Adams Street in the West Loop business district, houses the Chicago-Kent College of Law, Stuart School of Business programs, and the Department of Social Sciences' Master of Public Administration program.

IIT's Daniel F. and Ada L. Rice Campus is located at 201 E. Loop Road in west suburban Wheaton. It offers graduate and upper-division undergraduate courses and degree programs through evening and Saturday classes and through courses broadcast live over IITV (see below).

The university's fourth site is IIT Moffett Campus, location of the National Center For Food Safety and Technology (NCFST), a multidisciplinary food safety research facility in the southwest suburban Bedford Park area. The NCFST is a research consortium of IIT, IITRI, the U.S. Food and Drug Administration, the Department of Food Science of the University of Illinois Urbana-Champaign, and some 45 food industry member companies. The IIT Moffett Campus, created by CPC International Inc.'s $7 million gift, gives the university the opportunity to develop academic programs in food science and technology. A master of science degree and a certificate program in food safety and technology are offered at this facility.

IIT also offers courses at northwest suburban locations: selected undergraduate evening and Saturday classes are taught at Barrington High School, Barrington, and William Rainey Harper College, Palatine. Summer courses are taught at Harper College Northeast Center in Prospect Heights.

Students also may take classes through the William F. Finkl Interactive Instructional Network (IITV), which links classroom studios on campus with remote TV receiving sites. IITV's talkback feature permits students in receiving classrooms to participate in class discussions. IIT has arrangements with The Chicago Medical School, Oakton College East, the IIT Rice Campus, Elgin Community College, William Rainey Harper College, South Cook Educational Service Center, and Saint Xavier University so that regular students and the general public may have access to IITV. In addition, some 20 companies offer IIT courses to their employees at their places of employment. IITV students must be admitted to IIT as undergraduate or graduate students. For information, see the IIT Bulletin: Schedule of Classes or call IITV at (312) 567-3460.

Summer session courses are offered on IIT campuses, at other Chicago and suburban locations, and via IITV. Summer session tuition will be waived for those students who were registered as full-time students during both semesters of the previous academic year and have preregistered for the following fall semester. The summer session provides an excellent opportunity for students to further their degree programs or to enrich their backgrounds with complementary courses. High school seniors or beginning freshmen may also enroll. Those who wish to take courses for professional updating or to satisfy program requirements at other schools may apply to enroll as special students. Noncredit educational opportunities also are available during the summer session.

Campus Life

Activities outside the classroom and laboratory are an important part of a college education. IIT encourages all students to develop their leadership abilities and teamwork skills by participating in athletics, student organizations, and professional societies. Students also are encouraged to take advantage of the many cultural, educational, and recreational resources both on campus and in the Chicago metropolitan area.

Throughout the academic year, Grover M. Hermann Hall, the student union building, is the site for feature films, theatrical productions, and concerts—classical, rock, folk, jazz, and blues. Nicknamed the HUB, Hermann Hall houses the Office of the Dean of Students and has lounges, study areas, meeting rooms, student organization offices, an auditorium, a ballroom, a cafeteria, a pub, a bowling alley and game room, and a ticket office that sells discounted movie and other entertainment tickets.

IIT's Department of Athletics and Recreation offers a comprehensive program of varsity sports, intramural teams, instruction, and informal activities for both men and women.
The Arthur S. Keating Sports Center has a basketball court with seating for 2,000; an area for four basketball games to be played at one time; and volleyball courts. Keating also has a six-lane, 25-yard swimming pool; four racquetball/handball courts; and fitness and weight rooms. Outdoors, there are soccer, baseball, and football fields and tennis courts.
Recreational activities, open swimming hours, and open free play activities are available during structured hours.

The Scarlet Hawks men's varsity teams compete in intercollegiate baseball, basketball, cross-country, and volleyball; women varsity teams compete in cross-country, basketball, softball, and volleyball; a co-ed team competes in swimming. The university is an active member of the National Association of Intercollegiate Athletics (NAIA). Men, women, and co-ed intramural teams compete in 10 sports, and IIT has hockey, softball, sailing, and wrestling clubs.

More than half of IIT's full-time undergraduates live on campus in six residence halls for men and women and in four apartment buildings that house married students, single graduate students, faculty, and staff. In addition, there are two sororities and nine fraternities; eight fraternity houses make up what is known as the Fraternity Quadrangle. The fraternities and sororities have very active programs, and membership is open to commuting as well as resident students.

The campus is home to more than 70 student organizations both social and academic. The Student Activities Office (SAO), (312) 567-6879, oversees many student groups and acts as liaison between the administration and the various organizations.

The SAO is directly responsible for the Student Leadership Committee (SLC), student government; Union Board, which plans and funds most of the social and cultural activities on campus; Technology News, student newspaper; WOUI-FM (88.9), student radio station; and TechMate, the commuter student organization.

IIT's Chicago location offers students a wide range of activities. On the shores of Lake Michigan, Chicago boasts miles of attractive and well-used beaches and jogging and bicycle paths. Downtown Chicago--the Loop--and other recreational and commercial centers are a short bus or train ride from campus. The Chicago Symphony Orchestra and the city's ballet and opera companies are among the world's finest, and Chicago museums, art galleries, and theaters are famous. Ethnic neighborhoods throughout the city provide an international array of cultures and cuisines. Among Chicago's professional sports teams, two are IIT neighbors: the White Sox play at Comiskey Park, just a few blocks west of the Main Campus, and the Bears are at Soldier Field two miles south.

Academic Advising

IIT provides an in-depth academic advisory program for all full-time students. Before entering IIT, freshmen are given placement tests and helped to plan their first semester academic programs.

All freshmen participate in HAWK (Hands on Workshop), small classes taught in computer classrooms by faculty from the students' chosen fields. HAWK faculty serve as advisers and mentors, helping students explore opportunities and develop goals. HAWK has four major objectives: 1. To expose students to the academic and professional challenges of their disciplines via case studies; 2. to introduce freshmen to faculty and upperclassmen in their areas of concentration; 3. to develop personal computer productivity tools; and 4. to strengthen student leadership, cooperation, and study skills.

Throughout their academic careers, students continue to work with their faculty advisers in planning their programs of study for each semester.
Special advisers are available for IIT's legal and medical programs and for its various combined undergraduate/graduate degree programs.

STUDENT SERVICES

Career Development

Located in Farr Hall, IIT's Career Services Department is staffed by professionals who are trained to assist students in their career development needs.

The following services are available to IIT students and alumni:

_On-campus interviewing (for students only)
_Candidate referral program to companies not recruiting on campus
_Individualized job search and career development assistance
_Resume writing/interviewing techniques workshops
_Resume critiques and mock employment interviews
_Employer library and videotape collection
_Labor market and salary data
_Summer internships development and coordination
_Job books (experienced, entry-level, summer, and part-time)
_Career counseling and testing
_Cooperative education opportunities (see below)

Commuter Student Services

TechMate Program, the commuter student organization, enables students to gain a sense of community and become active in campus life. TechMate informs the commuter student about all the available student services and provides a mechanism for students to get to know each other. The group also plans a variety of events and activities throughout the year. TechMate is located in the SAO office in Hermann Hall, (312) 567-3084.

Cooperative Education

Cooperative Education is a learning approach that integrates college studies with working experiences in industry, business, and government. Since the ``cooperating'' companies usually rotate students through several different work assignments during their Co-op careers, students have the opportunity to gain exposure to a wide variety of professional challenges within their major fields.

All Co-op students must have and maintain at least a 2.25 G.P.A.
Engineering students who are in their second through fifth semesters at IIT enrolled as full-time students are eligible to apply to the Co-op Program. (Transfer students must have completed a minimum of 30 semester hours at their previous academic institutions.)

Engineering students alternate semesters, including summer, between full-time work and full-time study. This can allow anywhere from three to seven work periods ranging from 12 to 30 months and completion of degree requirements in 4 to 6 years.

Undergraduates in disciplines other than engineering are allowed more flexibility, including length and number of work terms and initial enrollment periods.

Salaries among IIT Co-op students are competitive and help defray educational expenses. The average salaries for engineering students range from $1,800 to $2,200 per month. Co-oping improves employment opportunities upon graduation.

For more information contact Career Services in Farr Hall, (312) 808-7110.

Counseling and Health Service

Located on the first floor of Farr Hall, (312) 808-7100, help is provided for educational, personal, or physical problems. Educational counseling can help a student study more efficiently by teaching a variety of study skills, including time management, textbook reading, note taking, memorization and concentration, and test taking. Personal counseling can help students get through crises or deal with a variety of problems, big and small. ll counseling information is strictly confidential. There is no fee for regularly enrolled IIT students.

Medical problems are treated on site by a physician and a nurse practitioner during posted office hours or referred out to local clinics and hospitals.

It is important that any illness or suspected illness be checked immediately in order to protect both the student and the university community as a whole. There is no charge for an office appointment. For emergencies occurring after office hours, call the Campus Police Department, (312) 808-6300, to be transported to the nearest emergency facility and notify Counseling and Health Service as soon as possible.

Cultural-Religious Programs
The university chaplain, (312) 567-3080, coordinates a network of programs under the title ``Life and the Spirit,'' a program dedicated to the development of the total person. There are forums, lectures, films, and programs integrating personal beliefs with life experiences. Spiritual, moral, religious, and personal needs also are met by organization meetings, worship in the Chapel, informal prayer groups, and weekend retreats. The chaplain also offers individual spiritual counseling. Students can participate in IIT's Volunteer Action Program for community service projects, including tutoring elementary and high school students, assisting hospital auxiliaries, conducting programs for the elderly, and involvement in programs such as the Blood Resource Center and Public Television membership telethons.

Dean of Students
The Office of the Dean of Students, (312) 567-3080, is responsible for student activities; residence life; fraternities and sororities; athletics and recreation; counseling services; orientation; career services; student health concerns; and the chaplaincy. Students are encouraged to contact the office, located in Hermann Hall, for help or referrals.

Disability Resources
Services for persons with disabilities are coordinated by the Office for Disability Resources in conjunction with the IIT Counseling Center in 105 Farr Hall. Persons with disabilities who are interested in applying for admission to any of IIT's educational programs, or who have been admitted but have not yet enrolled, are invited to call the Counseling Center prior to their arrival on campus to discuss their individual needs so that suitable arrangements can be made. Enrolled students with disabilities are encouraged to consult the office regarding access to IIT facilities. Office personnel may be reached at (312) 567-3503 (voice) or (312) 567-7549 for Telecommunications Device for the Deaf (TDD).

Educational Services
The Office of Educational Services, 101 Main Building, (312) 567-3300, provides a variety of academic services to undergraduate students. These include: evaluations of transfer credits; processing of student petitions; processing of applications for admission of part-time undergraduate students and reinstatement of all former undergraduate students; monitoring of academic progress; academic advising assistance; academic program audits; withdrawal from the university; immunization verification; notary public service; and certification of students' eligibility for graduation.

International Office
International Students and Scholars Center, 402 Farr Hall, (312) 808-8105, provides services to the international students and scholars on matters related to orientation, personal, visa, and immigration concerns. Social, cultural, and educational events are planned by the office and open to all students, faculty, and staff. The office also coordinates campus activities designed to encourage cross-cultural awareness and understanding among the members of the IIT community.

U.S. students interested in studying abroad should contact the International Office. (See “Overseas Programs'' on page ??.)

Minority Services
IIT has established the Hispanic Educational Development Center, (312) 567-3114, and the African American Educational Development Center, (312) 567-5249, to assist talented minority students who are interested in science, engineering, and professional careers. To ensure academic success, the centers work closely with these students in areas such as individualized tutoring, organization of study groups, financial aid and part-time employment, and provide a broad range of counseling assistance. Both offices are in Room 127, Perlstein Hall.
Residence Life

Located in the residence hall complex, the Residence Life Office offers programs and services designed to enhance student life in the residence halls. The director of residence life, (312) 808-6400, coordinates student security and office staff, resident advisers, and the Residence Hall Association (RHA). The staff offers a wide range of programs, from ski trips to life issue seminars.

Accreditation

IIT is accredited by the North Central Association of Colleges and Secondary Schools. Specific professional curricula are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, the American Psychological Association, the Council on Rehabilitation Education, the American Bar Association, the Association of American Law Schools, and the National Architectural Accrediting Board.

ACADEMIC RESOURCES

Libraries

IIT's library system includes the Paul V. Galvin Library and The Center for the Study of Ethics in the Professions Library on the Main Campus, the Louis W. Biegler Library on the Daniel F. and Ada L. Rice Campus, and the Chicage-Kent Library at the Downtown Campus. These libraries combined contain nearly three quarters of a million volumes.

Students can access holdings through the card catalogs; the ILLINET Computer Cataloging System, which provides information about the collections of 800 libraries and circulation information on 42 member college and university libraries throughout the state of Illinois; the Online Computer Library Center (OCLC), a nationwide network of 6,080 academic, private, and public libraries; and through corporate memberships such as the John Crerar Library at the University of Chicago and the Center for Research Libraries. With the proper hardware and software specification, the ILLINET Online Computer System can also be accessed through the GALLIB shell on the VAX system.

The Galvin Library, named after the founder of Motorola Inc., is IIT's central library and provides a broad range of services to meet student needs. Patrons can access ILLINET and can also obtain materials and information on engineering, business, science, mathematics, the humanities, architecture, and design through CD-ROMs and other computerized databases, a document delivery service, special collections, and interlibrary loan. A reference librarian ia available at (312) 567-3355.

The Center for the Study of Ethics in the Professions (CSEP) Library, (312) 567-6913, contains a variety of material including codes of ethics, a referral bank of ethic centers, books, professional journals, newsletters, bibliographies, government reports and regulations, and conference proceedings dealing with topics in practical and professional ethics such as autonomy, confidentiality, loyalty, conflicts of interest, and self-regulations. The CSEP Library is located in Room 166, Life Sciences Building.

Named for IIT alumnus Louis W. Biegler, the Rice Campus library, (708) 682-6050, contains the Alva C. Todd Collection of electrical engineering materials and a small reference and journal collection. Biegler library also maintains CD-ROM titles, including Compendex Plus, ABI-Inform, and other engineering and computer science databases. Services include interlibrary loan, computer searches, research consultations, reference services, and referrals to other colleges and universities.

The Chicago-Kent College of Law Library, (312) 906-5600, is a technologically advanced library with outstanding collections in law, business, and the social sciences. The Chicago-Kent library also houses the Library of International Relations, (312) 906-5620, which has one of the largest collections of international law and commerce materials in the Midwest and is an official depository of the United Nations.

Two other libraries are being established. The Moffett Campus Library will support research on food technology and safety. The Graham Resources Center in Crown Hall on the Main Campus will be a fully automated architecture library.

Computer Facilities

The Academic Computing Center (ACC) (312567-5962) operates six time-shared computers with terminals located in most academic buildings, the residence halls, and Galvin Library. The computers include two parallel processing minicomputers: an Encore Multimax (BSD43) and a Harris Nighthawk (SVR4); a cluster of DEC minicomputers; a VAX model 3600 and two 3100s; and a Prime 9755 system.

ACC also has many networked personal computer classrooms with 386 PCs and Macintoshes. Most academic departments operate PC labs for their courses and research programs. ACC supports numerous programming languages and special software packages for a variety of disciplines and also offers seminars and tutorials on computer system use.

At the Daniel F. and Ada L. Rice Campus (708-682-6060), a Sun CAD facility is available with a network of eleven SPARC 1 and 2 workstations. Personal computer facilities include IBM PS/2s, Macintoshes, and 386 PCs. Laboratory equipment is available to support courses in electrical engineering and computer science. The Rice Campus computers are networked with ACC on the Main Campus.

The Educational Technology Center (ETC) (312-567-5216) is a multi-media resource center providing tutoring, testing and grading, remediation, and enrichment materials for IIT students. ETC's computerized quizzing system, developed by IIT faculty and students, serves the major undergraduate chemistry, computer science, math, and physics courses. ETC maintains a comprehensive library of math, physics, chemistry, psychology, and self-help videotapes, CD-ROM and CAD workstations, and several computers dedicated to running various educational and professional software packages.

Research

Faculty and students participate in research through a variety of centers, programs, and institutes, some of which are briefly described below.

Advanced Building Materials and Systems Center conducts studies and analyses of new, experimental, or unusual building materials, either in the field or in the Advanced Building Materials Laboratory on the IIT Main Campus. Dr. Sidney A. Guralnick, Director, (312) 567-3549.

American Power Conference sponsors an annual meeting, usually in April, for discussion of many aspects of fuels, generation, transmission, distribution, and utilization of electric power. Dr. Robert Porter, Director, (312) 567-3196.

Biotechnology Center brings together biologists, chemical engineers, and food scientists to focus on bioprocesses of immediate importance to industry; includes the Biotechnology Division of the National Center for Food Safety and Technology (see pages 5 and 14). Dr. Robert M. Roth, Director, (312) 567-3480.

Center for Applied Psychological Service and Research conducts vocational, psychological, and neuropsychological evaluations to determine treatment needs of persons with physical or mental disabilities and offers sports and performance psychology services for athletes and other performers. Dr. Chow Lam, Director, (312) 567-3514.

Center for Environmental Research, a joint IIT and IIT Research Institute endeavor, assists government agencies, industries, and consulting firms in environmental areas. Dr. Demetrios Moschandreas, Director, (312) 567-4310.

Center for Excellence in Polymer Science and Engineering, established with a grant from Amoco Foundation, concentrates research and educational efforts on processing raw polymer materials into finished products, analyzing the properties of polymers, and manufacturing and recycling polymers. (312) 567-3040.

Center for Law and Computers was established to do research and to educate law students and lawyers on the application of computers to the profession. Mr. Ronald W. Staudt, Director, (312) 906-6800.

Center for Research on the Impacts of Information Systems, a consortium of IIT faculty members and information management executives of leading Midwestern corporations, conducts research programs to help information professionals manage complex systems more effectively. Dr. Martin Bariff, Director, (312) 567-5106.

Center for Research on Industrial Strategy and Policy provides a focus for faculty research on critical strategic managements issues for technology-intensive organizations. Dr. M. Zia Hassan, Director, (312) 567-5106.

Center for the Study of Ethics in the Professions conducts interdisciplinary research, course development, workshops, and conferences on practical moral issues in the professions (also see page 11). Dr. Vivian M. Weil, Director, (312) 567-3017.

Center for Synchrotron Radiation Research and Instrumentation promotes application of the tools and techniques of synchrotron radiation to science and engineering research. Dr. Timothy I. Morrison, Director, (312) 567-3381.

Design Processes Laboratory, located in IIT's Institute of Design, offers state-of-the art systems for computer-supported design (also see page 180). Mr. Charles L. Owen, Director, (312) 567-3461.

Energy - Power Center develops research and educational activities in direct response to the needs of the energy and power industries. Included in the Center's diverse activities is the Energy Technology Program, which focuses on research in the field and sponsors the American Power Conference, the premier forum for the electric utility industry (see page 13). Dr. Henry Linden, Director, Energy - Power Center, Dr. Hamid Arastoopour, Director, Energy Technology Program, (312) 567-3095.

Fluid Dynamics Research Center conducts experiments and theoretical studies on fluid flow management and control and is the site for the National Diagnostic Facility, the world's largest university wind tunnel completely dedicated to basic research. Dr. Hassan Nagib, Director, (312) 567-3175.

IIT Research Institute (IITRI) is IIT's not-for-profit research affiliate where scientists, engineers, programmers, and technicians solve problems for business, industry, government agencies, and other educational institutions (also see page 4). Mr. John B. Scott, President, (312) 567-4000.
Instrumented Factory for Gears (INFAC) was established in 1989 with a Department of Defense contract to advance the manufacturing and processing capabilities of the U.S. gear and precision machining and manufacturing industries. Dr. Jarad Jackson, Program Manager, (312) 567-4952.

Manufacturing and Materials Process Engineering Center brings together the resources of IIT and IITRI, industry, and government to innovate educational and research programs in this field. Dr. Stephen M. Copley, Director, (312) 567-3052.

Manufacturing Productivity Center investigates productivity-related issues for more than 150 client companies and government agencies. Dr. Keith E. McKee, Director, (312) 567-4800.
National Center for Food Safety and Technology, formed by IIT, IITRI, the U.S. Food and Drug Administration, the University of Illinois, and industrial sponsors, was created in 1988 to ensure the continued safety and quality of our food supply (also see page 5). Dr. Richard V. Lechowich, Director, (708) 563-1576.

Pritzker Institute of Medical Engineering explores the application of engineering instrumentation and concepts to the solution of health care problems. Dr. Robert C. Arzbaecher, Director, (312) 567-5324.

Telecommunications Systems Center, an industry/university cooperative center, provides an environment for directed, innovative research in methods of system integration, technological assessment, and training, all with the involvement of both the manufacturing and users industries. Dr. Henry Stark, Director, (312) 567-3400.

THE COLLEGES OF ILLINOIS INSTITUTE OF TECHNOLOGY

Every student and faculty member belongs to one of the colleges, schools, or institutes that form IIT. A student who changes majors will apply for admission both to the new department and to its college, school, or institute.

Students are encouraged to discuss their academic concerns with the appropriate dean, director, associate or assistant dean listed below.

College of Architecture
Acting Dean: Mr. John F. Hartray
Associate Dean: Dr. Kevin Harrington
S.R. Crown Hall(312) 567-3230

The program in architecture was established at Armour Institute of Technology, one of IIT's predecessors, in 1892. In 1938, the program came under the directorship of the world-renowned architect and educator Ludwig Mies van der Rohe. The program in city and regional planning was initiated in 1938 with the appointment of Ludwig Hilberseimer. The College is housed in S.R. Crown Hall, one of Mies's and Chicago's most famous architectural works.
The College emphasizes both applied studio work under the direction of practicing architects and the study of architectural theory (that may include a semester studying architecture in Europe). Students working toward the degrees in architecture are members of the College of Architecture.

Armour College of Engineering and Science
Dean: Dr. Stephen M. Copley
Associate Dean: Dr. Gerald F. Saletta
117 Engineering 1(312) 567-3009

The Armour College of Engineering and Science is named for IIT's predecessor, Armour Institute of Technology, which was established on the site of the present IIT campus in 1892. The elegant red brick buildings that stand at the west side of the Main Campus were part of the original Armour Institute. Armour College prides itself on its ability to combine traditional programs in engineering and science with curricular innovations that provide flexible educational opportunities.

In addition to the traditional departments in the natural sciences, computer sciences, mathematics, and the engineering disciplines, the College is home to the Pritzker Institute of Medical Engineering, which explores applications of medical instrumentation and theory to problems in health care and medical research.

The following departments are in Armour College: Biology, Chemistry, Chemical Engineering, Civil Engineering, Computer Science, Electrical and Computer Engineering, Engineering Graphics, Environmental Engineering, Mathematics, Mechanical and Aerospace Engineering, Metallurgical and Materials Engineering, Physics, and Reserve Officer Training Corps for Navy and Marines, Air Force, and Army.Chicago-Kent College of LawDean: Mr. Richard Matasar
Associate Dean: Mr. Howard S. Chapman

Downtown Campus (565 W. Adams St.)(312) 906 -5008
The Chicago-Kent College of Law is the second oldest law college in Illinois. When it joined the university in 1969, IIT became the first major institute of technology to include law among its disciplines. A shuttlebus travels between the Main Campus and the Downtown Campus.
Chicago-Kent College offers programs leading to the degrees of Juris Doctor, Master of Laws, and Master of American Law. Although the College does not offer an undergraduate degree, it participates in double degree programs and an honors program that are described on page 177. The College also offers a specialized minor in legal studies for students who are admitted into one of these programs. The Chicago-Kent Library is open to IIT undergraduates doing research in relevant fields.

Institute of Design
Director: Mr. Patrick F. Whitney
IITRI Research Tower (10 W. 35th St.)(312) 808-5300

The Institute of Design--founded by Laszlo Moholy-Nagy in 1937 and named the ``New Bauhaus'' after Germany's international school of design--merged with IIT in 1949. Since its founding, the Institute of Design has attracted students and faculty from around the world who have experimented with new media, new processes, and new theories of design. ID is the first U.S. school to offer a Ph.D. in design.

The undergraduate program at the Institute of Design leads to the degree of Bachelor of Science in design with professional specializations in communication design, photography, and product design.

Lewis College of Liberal Arts
Dean: Dr. Glen O. Geist
Associate Dean: Dr. John W. Snapper
182 Life Sciences(312) 567-3008

Lewis College is named for the Lewis Institute, which was founded in Chicago in 1896 under a bequest of Allen C. Lewis. Lewis and Armour Institute merged in 1940 to form IIT. Lewis' degree programs are designed to encourage interdisciplinary study, often with other IIT colleges. The Science and Technology in Context (STX) program, for instance, offers students the opportunity to study the history of physics or the legal policies that influence the engineering professions. In addition to the departments of humanities, psychology, and social sciences, Lewis College is home to the Center for the Study of Ethics in the Professions, which sponsors research and educational projects relating to applied ethics.

Students seeking degrees in the following fields are members of the Lewis College: English, History, Philosophy, Political Science, Psychology, Public Administration, Rehabilitation Services, STX, Sociology, and Technical and Professional Communications (certificate program).

Stuart School of Business
Dean: Dr. M. Zia Hassan
Assistant Dean: Ms. Marcia I. Edison
Downtown Campus (565 W. Adams St.)(312)906-6500

The Stuart School of Business was established in 1970 with a gift from the estate of IIT alumnus and Chicago financier Harold Leonard Stuart. The Stuart School's primary focus is to provide students with a high-quality business education. All degree programs emphasize an understanding of the individual's professional responsibility and role in the global business environment. The school houses the Center for Research on Industrial Strategy and Policy and the Center for Research on the Impacts of Information Systems.

The Stuart School offers four degree programs: the B.S. in Accounting, the B.S. in Business Administration, the B.S. in Financial Markets and Trading, and the B.S. in Management Information Systems. Two double degree programs are also offered: the B.S./M.B.A. and the B.S./J.D.

The Graduate School
Dean: Dr. H. Lennart Pearson
Assistant to the Dean: Ms. Mamie Phillips
301 Main Building(312) 567-3024

The Graduate School coordinates the programs of advanced study offered by the departments and colleges of the university. The Master of Science degree may be earned in 20 fields and the Doctor of Philosophy in 14 fields. The Professional Master's degree is also offered in 11 fields (see page 24).

UNDERGRADUATE CURRICULA AT IIT

IIT combines excellence in academic preparation for professional careers with opportunities for practical experience in the major branches of engineering, the sciences, mathematics, business, architecture, design, computer science, and liberal arts. General education requirements are included in this section. Specific degree requirements are described in departmental listings that begin on page 62. Professional specializations, or concentrations in an area within a major, are described in the sections devoted to each curriculum. Minors, concentrations in an area outside a major, are listed on page 28.

Undeclared Majors

Students who are unsure of their career choices may enter IIT as undeclared majors. During the first year, undeclared majors take required general education courses. These courses in science, math, computer science, humanities, and social sciences provide the foundation for nearly all of IIT's major programs. Because many general education requirements apply to all programs, students who change majors or wait as late as the sophomore year to declare a major can often still graduate after the normal eight semesters.

General Education Requirements

The general education program is designed to ensure that all IIT graduates have a basic understanding of certain essential areas of knowledge. The general education program sets minimal requirements. Most departments of major study require additional courses in these areas, which are stated under the individual major degree requirements.

A. Basic Writing Proficiency: 0 credit hours. Students must show basic writing proficiency, either by passing English composition (ENGL 101, 105, or 111) at IIT or by receiving a high pass on the English Proficiency Examination administered by IIT. Most students satisfy this requirement by taking ENGL 101, which may be applied toward the general education requirement in humanities. Because writing courses completed elsewhere do not satisfy this requirement, transfer students who do not receive a high pass on the Proficiency Exam must repeat ENGL 101 at IIT. Students must take the English Proficiency Exam before beginning classes at IIT, and they must satisfy the basic writing requirement within their first year at IIT. The requirement must be satisfied before taking HUM 100-level courses, HUM 300-level courses (marked in course descriptions with an H), 300-level social science courses (marked with an S), or engineering design courses.

General Education Requirements

B. Mathematics: 5 credit hours. The five credit hours must be above MATH 110.

C. Computer Science: 2 credit hours. All students must take CS 103 or 105, or a computer science course at the 200 level or above. (The freshman seminar HAWK courses do not satisfy this requirement.)

D. HAWK: 1 credit hour. All students must complete the HAWK seminar in the freshman year. (Students entering with 30 hours or more of transfer credit are excused from HAWK. However, these students must take at least three hours in computer science to fulfill both HAWK and computer science requirements.)

E. Humanities: 12 credit hours. Courses that satisfy this requirement are marked with an H in this Bulletin. These must be distributed as follows:

(a) HUM 100-level course (HUM 102, 104, or 106)
(b) At least two courses marked with an H on the 300 level or above.

An English composition course (ENGL 101, 105, or 111) may be applied toward the requirement. Some students may use foreign language courses at the 200 level to fulfill the 300-level requirement. Engineering students wishing to use foreign language courses must confirm their eligibility with the associate dean of Armour College.

F. Social Sciences: 12 credit hours. Courses that satisfy this requirement are marked with an S in the bulletin. These must be distributed as follows:

(a) At least two courses on the 300-level, or above.
(b) At most nine credit hours in a single field.

(c) At least six credits in a single field.
(MGT 351 is considered to be in the same field as economics.)

G. Natural Science or Engineering: 11 credit hours.

This component may be satisfied by courses in engineering (aerospace, chemical, civil, electrical, engineering graphics, environmental, mechanical, metallurgical) or the natural sciences (biology, chemistry, physics), or by courses marked with an N in psychology. The courses must be distributed as follows:

(a) Two sequential natural science or engineering courses in a single field. (CHEM 124 with METM 101 satisfies this requirement.)
(b) At least one natural science or engineering course in a second area.

Special Academic Requirements

Several IIT colleges have special requirements that go beyond or modify the basic general education requirements.

1. Policy on Writing. In recognition of the importance of writing with clarity, the faculty has formally adopted a policy on writing: Faculty members in all disciplines will take note of writing deficiencies and will provide specific guidance. When necessary, students will be required to make use of university resources, such as the Writing Clinic, (312) 567-3465, and the Educational Technology Center, (312) 567-5216.
2. Science for Engineering and Science Majors. The Bachelor of Science degree programs offered by departments in the Armour College of Engineering and Science and in the Lewis College of Liberal Arts require the following courses, which may be applied to the general education requirements:
   (a) Mathematics: MATH 151 and MATH 152, and at least one course numbered 200 or above. Although students may be required to take courses numbered below MATH 151, they do not apply as credit toward graduation.
   (b) Physics: PHYS 103, PHYS 104.

   The Bachelor of Science degrees offered by the Institute of Design and the Stuart School of Business do not have this requirement. The Bachelor of Arts degree does not have this requirement.

3. Non-Applicable Courses. Some courses are marked as not applying to graduation for degrees ``in engineering or the physical sciences.'' Unless specifically mandated by the degree program, these courses do not apply to graduation and do not satisfy degree requirements in any Bachelor of Science degree programs offered by departments in Armour College or in Lewis College (including mathematics, computer science, psychology, working toward Bachelor of Science degrees in the Institute of Design or the Stuart School of Business or the Bachelor of Arts degree are not affected by this requirement.
4. HAWK for Engineering and Computer Science. Students seeking degrees in engineering and computer science take two, sequential, one-hour HAWK courses, which must be completed in the freshman year.
5. Social Science for Engineers With Specializations. The social science general education requirement is modified for students in engineering degree programs who complete a minor or professional specialization that is endorsed by their degree program. These students must complete:
   (a) A minimum of nine credit hours marked with an S.
   (b) Students who satisfy the specialized minor in management through use of 12 hours of technical electives must take at least six credit hours from the areas of psychology, anthropology, sociology, or political science.

Bachelor of Arts Degree

(c) At least three hours must be at the 300-level.
(d) At least six hours must be in a single field.
Engineering majors who do not complete an endorsed minor or professional specialization take 12 hours in the social sciences.

6. Advising Requirements. Students must follow the advice of their academic advisers. The adviser may ask a student to take, avoid, or repeat specific courses, even though this is not a university or departmental requirement.

7. Free Electives. Free electives must satisfy requirements set by the university and by the department of major study.
8. Placement Tests. Placement test results may require some students to take more credit hours for graduation than are otherwise indicated by the department of major study.
9. Additional Academic Requirements. Students must satisfy all university rules and all requirements set by their department of major study.

Bachelor of Arts Degree

IIT's bachelor of arts degree has an interdisciplinary focus. This allows specially qualified students to design individualized programs in areas of personal interest. With the help of an academic adviser, each B.A. student creates a Program of Study that includes work in both major and minor concentrations. The Program of Study must be submitted by the junior year for review by the chairman of the Bachelor of Arts Committee and by an examiner in the Office of Educational Services. In the senior year, all B.A. candidates participate in a capstone interdisciplinary seminar.

The bachelor of arts program creates opportunities to study in areas that are not defined within the usual curricula. For instance, in recent years students have combined major concentrations in sociology with minor work in the graduate level in city and regional planning. These students have done senior projects on the social use of space. Other students have combined undergraduate work in technical and professional communications with a minor study in engineering fields and have done senior work on the rhetorical styles used in engineering proposals. Such options are open only to students who show themselves qualified to do high-level work in both the major and minor concentrations.

Students in the B.A. program are members of the department and college of major concentration. Major concentrations are available in:

Biochemistry	(page 70)
Biology	(page 74)
Chemistry	(page 113)
Computer Science	(page 137)
English	(page 164)
English Literature	(page 164)
History	(page 165)
Mathematics	(page 191)
Philosophy	(page 165)
Physics	(page 224)
Political Science	(page 259)
Psychology	(page 231)
Rehabilitation	(page 235)
Science and Technology in Context	(page 253)
Sociology	(page 260)
Technical and Professional ommunications	(page 165)

The academic adviser is generally a representative from the area of major concentration. Each department offering a major concentration is represented on the Bachelor of Arts Committee. The minor concentration may be any minor (page 28) consisting of courses from outside the major concentration. In addition, students may create an individualized minor with the approval of the Bachelor of Arts Committee.

The minimum degree requirements are:

1. Major concentration, at least 33 credit hours
2. Minor concentration, at least 15 credit hours
3. Humanities, at least 15 credit hours
4. Social Sciences, at least 15 credit hours
5. Senior Seminar (STX 411), at least 3 credit hours
6. All General Education requirements listed on page 19 (12 of the 15 credit hours in humanities and in social sciences may be applied toward the General Education requirements)

7. All additional requirements set by the department of major concentration.

Degree Programs
Accounting: B.S.
Aerospace Engineering: B.S.*
Applied Mathematics: M.S.
Applied Statistics: M.S.
Architecture: B.Arch. and M.Arch.
Biology: B.S., B.A.*, M.S.*, Ph.D.
Business Administration: B.S., M.B.A.*
Chemical Engineering: B.S.*, M.S.*, Professional Master's (M.Ch.E.)*, Ph.D.
Chemistry: B.S., B.A.*, M.S.*, Professional Master's (M.Chem.), Ph.D.
City and Regional Planning: Professional Master's*
Civil Engineering: B.S.*, M.S.*, Professional Master's (M.C.E.), Ph.D.
Computer Science: B.S.*, B.A.*, M.S.*, Master of Science for Teachers (M.S.T.)*, Ph.D.
Computer Systems Engineering: M.S.*
Design: B.S., M.S., Professional Master's, Ph.D.
Electrical Engineering: B.S.*, M.S.*, Ph.D.
English: B.A.*
Environmental Engineering: M.S.*, Ph.D.
Financial Markets and Trading: B.S., M.S.*
Food Safety and Technology: M.S.*
History: B.A.*
Law: J.D.*, Master of Laws*, Master of American Legal Studies
Management Sciences: Ph.D.*
Management Information Systems: B.S.
Manufacturing Engineering: M.S.*, Professional Master's (M.M.E.)*
Mathematics: B.S., B.A.*, M.S., Ph.D.
Mechanical Engineering: B.S.*
Mechanical and Aerospace Engineering: M.S.*, Professional Master's (M.M.A.E.)*, Ph.D.
Metallurgical Engineering: B.S.
Metallurgical and Materials Engineering: M.S., Professional Master's (M.M.M.E.)*, Ph.D.
Philosophy: B.A.*
Physics: B.S., B.A.*, M.S., Ph.D.
Political Science: B.A.*
Psychology: B.S., B.A.*, M.S.*, Ph.D.
Psychology/Sociology: B.S.
Public Administration: M.P.A.*
Rehabilitation Counseling: M.S.
Science and Technology in Context (STX): B.S.
Sociology: B.A.
Specialization Programs:
Biochemistry within a
B.S. in Biology
B.A. in Chemistry
B.S. in Chemistry
Biotechnology within a
B.S. in Biology
B.S. in Chemical Engineering
Rehabilitation Services within a
B.A. in Psychology/Sociology
Certificate Programs in:
Engineering Graphics
Food Safety and Technology

Post-Baccalaureate Certificate Progr ams in:
Computer Science
Electrical and Computer Engineering
Environmental Engineering

Technical Communications

Double degree programs include:
Bachelor's/Juris Doctor
Bachelor's/M.B.A.
Bach. Arch./M.B.A.
Bach. Arch./Master of Civil Engineering
Bachelor's/M.P.A.
B.S./M.S. in Medical Physics**
B.S./M.D.**
B.S./M.S. in engineering

Other programs:
* Air Force, Army, and Navy R.O.T.C.
* Overseas programs for junior-year students majoring in architecture and some branches of engineering
* Cooperative Education
* Prelaw, Predental, Premedical
*May be completed on a part-time basis
**With the University of Health Sciences/The Chicago Medical School in North Chicago, Illinois.

Double Degree Options
IIT's Master's Plan double degree options allow students to earn two degrees in as few as five years. The university has created bachelor's/master's combinations in fields that are in demand in cutting-edge technologies and professions where graduate training is virtually essential.

Students may enter some double degree programs either through the Honors Track or the Standard Track.

Through the Honors Track, exceptional students may be admitted simultaneously into both the undergraduate and graduate schools when they apply to IIT. Admission will be based on their high school records, including grades, test scores, and faculty/employer recommendation, and other documentation.

Under the Standard Track, students are admitted into the undergraduate department offering the bachelor's portion of the program.

Double-Degree Options
Depending upon their interests, capabilities, and goals, students may, with the permission of their advisers and department chairmen, design their own combined-degree programs or select one of the following options:
* B.S./M.S. in Chemical Engineering with biomedical engineering specialty (undergraduate major: chemical engineering)
* B.S./M.S. in Manufacturing Engineering (undergraduate major: chemical, mechanical, or metallurgical engineering)
* B.S./M.S. in Food Safety and Technology (undergraduate major: biology, chemistry, or chemical engineering)
* B.S./M.S. in Computer Systems Engineering (undergraduate major: electrical engineering or computer science)
* B.S./M.S. in Environmental Engineering (undergraduate major: civil, chemical, environmental, or mechanical engineering; physics, chemistry, or biology)
* Bachelor's/M.S. in Medical Physics (B.S. in physics at IIT and the M.S. in medical physics at The Chicago Medical School. See page 211 for more information.)
* Bachelor's/Master of Business Administration. See page 92.
* Bachelor's/Master of Public Administration. See page 260.

Seven-Year B.S./M.D. Honors Program in Engineering and Medicine
In addition to traditional premedical studies (see page 198), IIT offers an accelerated degree program in which freshmen simultaneously go through joint admissions procedures at IIT and the University of Health Sciences/The Chicago Medical School, 3333 Green Bay Road, North Chicago, Ill. The first three years are spent at the IIT campus where students begin working on degrees in

computer science or in electrical, mechanical, or chemical engineering. The final four years of the Seven-Year Honors Program are spent at The Chicago Medical School. Participants in the program earn bachelor's degrees from IIT and medical degrees from The Chicago Medical School. This innovative program is designed to meet the urgent and intensifying need for technologically proficient physicians and researchers. For more information, contact Dr. Robert J. Jaeger, Director, Seven-Year Honors Program in Engineering and Medicine, (312) 567-3926.

B.S./J.D. Programs
Students who plan to enter law school after completing their undergraduate programs (see Legal Studies section) might instead consider two accelerated B.S./J.D. programs offered with Chicago-Kent College of Law at the IIT Downtown Campus.

Honors Law Program
The Honors Law Program permits students to receive both bachelor's and law degrees in six years, rather than the normal seven. Students who are admitted to the Honors Law Program are conditionally admitted to Chicago-Kent College of Law of Illinois Institute of Technology at the same time they are admitted to IIT.

They may continue in the program as long as they maintain an undergraduate GPA of 3.0 and score well on the Law School Admission Test (LSAT) in the third year of the program.
The program is only available to new IIT freshmen who are specially prepared to complete it. Prospective IIT honors students in engineering, liberal arts, sciences, and business programs may apply. Applicants should rank in the top 10 percent of their high school classes, score in the top 10 percent on the SAT or ACT, and be interviewed by representatives of IIT and the

Chicago-Kent College of Law. During the admissions process, a program of study will be prepared that leads to a bachelor's degree in the student's chosen field within four years and a Juris Doctorate (J.D.) within two additional years. For more information, contact Dr. Paul DeForest, Legal Studies Adviser, (312) 567-5131.

Bachelor's/J.D. (``3-3 Option'')
This option, which is described in detail on page 178, is available to students in IIT liberal arts, sciences, and business programs. Since qualified students may earn both bachelor's and J.D. degrees in six years, those who are interested should inform the departmental and legal studies advisers as early as possible after their admission to IIT.

Interdisciplinary Architecture Programs
Two interdisciplinary six-year programs are available to undergraduate architecture students:
Bachelor of Arch./M.B.A.
Those who qualify may earn both degrees in six rather than the normal seven years. See page 65.

Bach. Arch./Master of Civil Engineering (Structures)
Qualified students may earn both of these degrees in six rather than the normal seven years. Undergraduate architecture students at IIT who are completing their eighth semester, or an equivalent of 124 hours, and have taken preparatory civil engineering courses may apply for entry into the combined program. For more information see the Civil Engineering section of the current Bulletin: Graduate Courses.

Overseas Programs,
IIT architecture majors spend one semester in Italy, and students in some branches of engineering and sciences may have an opportunity to spend their junior year abroad. Students who wish to participate in any of the overseas programs should verify their eligibility with their faculty advisers no later than their sophomore year.

Students participating in the programs pay their regular tuition and room and board expenses to IIT, which are used to cover their living expenses abroad. Some students pay their own air fares and recreational expenses.

German Academic Exchange Service
An IIT student can receive full tuition and living expenses plus round trip air transportation for a year of study in Germany. Graduating seniors who are U.S. citizens between the ages of 18 and 31 are eligible; a knowledge of German is required.

Institute National des Sciences Appliquees (INSA)
Since 1965, IIT has had an exchange program with INSA in Lyon, France. Each year, a few qualified science and engineering students take French during the spring semester of their sophomore year to prepare for spending their junior year at INSA. Before the student leaves IIT, a faculty adviser will carefully select courses from INSA's curriculum to match the student's IIT degree program. On return, the student pursues senior-year courses according to the IIT curriculum.

Robert Gordon Institute of Technology (RGIT)
IIT is engaged in an exchange program with the Scott Sutherland School of Architecture of RGIT in Aberdeen, Scotland. Each year, two third-year architecture students are selected to spend their junior years abroad. Interested students should apply in their sophomore years.

University of Navarre
An exchange program with the School of Engineering at the University of Navarre, San Sebastian, Spain, is open to mechanical, electrical, and metallurgical engineering majors.
For more information about other overseas programs, contact the International Students and Scholars Center, 402 Farr Hall, (312)808-7105.

Minors
Minors generally consist of five courses and are optional and frequently cross-disciplinary. Because they provide a coherent set of ideas, concepts, and educational experiences in a variety of areas, a student will often find that they enhance his or her potential for professional development. A student who wishes to pursue a minor must select this minor field of study in consultation with an adviser in his or her major department. NOTE: Not all specialized minors are applicable to all majors. Some may require more than a normal course load to satisfy requirements. The social science general education requirement is modified for students in engineering degree programs who select an endorsed minor (see Special Academic Requirement number 5 on page 21).

Following are some sample minors.
Accounting: ACCT 130, ACCT 131, ACCT 330, ACCT 332, ACCT 337.
Actuarial Science: MATH 332, MATH 470, MATH 475, MATH 476, and MATH 486 or MATH 487.

Aerospace Engineering (ME majors only): MAE 330, MAE 339, MAE 439, MAE 440, MAE 441, MAE 442.

Air Force Aerospace Studies: AS 101, AS 103, AS 203, AS 205, AS 310, AS 311, AS 408, AS 409. Students must meet all entrance requirements for the Professional Air Force Officers Course.

Anthropology: ANTH 202, ANTH 211, ANTH 212, ANTH 344, ANTH 412.
Applied Chemistry_at least five of the following courses: CHE 202, CHE 301, CHE 303, CHE 351, CHE 422, METM 318, METM 400, METM 480, METM 483.

Applied Mathematics: MATH 370, MATH 402, MATH 461, MATH 487, and MATH 470 or MATH 488. Chemical engineering students should substitute one of the above courses with CHE 426 or an equivalent engineering science course.

Applied Psychology: PSYC 201, PSYC 301, PSYC 303, PSYC 310 or SOC 201, PSYC 340.
Applied Solid State Physics: PHYS 348, PHYS 412, PHYS 415, and at least two of the following courses: PHYS 300, PHYS 405, PHYS 418, PHYS 427, PHYS 428, PHYS 437.
Architectural Technology: EG 105, EG 308, EG 309, EG 310, EG 312, EG 313.

Artificial Intelligence: CS 200, CS 330, CS 331, CS 440, CS 480.
Biochemistry: BIOL 403*, BIOL 404, BIOL 410, BIOL 425, BIOL 445, and either BIOL 561 or CHEM 538.

Bioengineering: BIOL 107, BIOL 115, CHE 410/510 and at least two of the following courses: BIOL 401, BIOL 403, BIOL 430, CHE 492, CHE 426.

Biological and Medical Physics: BIOL 115*, CHEM 237, CHEM 239, PHYS 300, PHYS 410. If possible, students should augment this option with BIOL 107.
Biology: BIOL 107, BIOL 109, and four additional courses in biology.
Chemistry--at least 15 credit hours must be completed from the following courses: CHEM 247, one of the sequences: CHEM 237, 239 or CHEM 243, 244, and electives chosen from: CHEM 321, CHEM 334, CHEM 335, CHEM 455.

Computational Structures: CS 200, CS 330, CS 331, CS 430, MATH 370.
Computer Architecture--at least 15 credit hours must be completed from the following courses: CS 200, CS 331, CS 350, CS 450, CS 470, CS 471, CS 472.
Computer-Supported Design: ID 331, ID 415, ID 447, ID 467, ID 468.

Construction Management: CE 470, CE 471, CE 472, CE 473, ECON 423.
Database Management: CS 200, CS 325, CS 331, CS 425, CS 430.

Design Process: ID 331, ID 333, ID 340, ID 415, ID 447.
Digital Electronics--at least 15 credit hours must be completed from the following courses: EE 228, EE 229, EE 242, EE 311, EE 427, EE 441, EE 446.
Electromechanical Design and Manufacturing (AE and ME majors only)

AE majors: MAE 479, MAE 481, MSC 312, EE 228, EE 242, EE 441 (replaces EE 386).

ME majors: MAE 480, MAE 481, MSC 312, EE 228, EE 242, EE 441 (replaces EE 386).
Electronic Circuits--at least 15 credit hours must be completed from the following courses: EE 203, EE 311, EE 312, and at least one of the following courses: EE 414, EE 416, EE 426, EE 427.
Energy and Power/Environmental/Economics (E3)three or six credit hours in Special Problems or Research in Energy (CHE 429 or MAE 491/497 or EE 491/497). In addition, at least one course from each of the following three areas:

Energy Sources and Conversion: CHE 430, CHE 460, CHE 465, CHE 481, CHE 482, CHE 483, MAE 450, and EE 331, EE 431.

Energy and Power Distribution and Utilization/Environment: CHE 461, CHE 488, CHE 489, MAE 452, MAE 453, MAE 454, ENVE 450, ENVE 463, ENVE 476, ENVE 480, EE 411, EE 419, EE 420, EE 434/438.
Energy Analysis, Economics, and Policy: CHE 426, CHE 541, CHE 543, ECON 423, LAW 330, PS 338, CS 480. Appropriate course substitutions may be made with the approval of the energy technology program advisers.

Engineering Analysis: MATH 332, MATH 402, MATH 461, MATH 470, MATH 488.
Engineering Graphics and CAD: EG 105, EG 305, EG 306, EG 405, EG 406, EG 419.
Environmental and Human Factors in Design: ID 255* or ID 256, ID 364, ID 414, ID 447, ID 466.

Environmental Engineering: ENVE 404, ENVE 463, ENVE 480 and two courses from the following: CHE 426, ENVE 401, ENVE 410, ENVE 450, ENVE 476.
Finance: ACCT 130, FIN 350, MATH 221 or MSC 221 and at least two of the following courses: FIN 452, FIN 453, FIN 454, FIN 475.

Fire Protection and Safety Engineering: CE 421, CE 422, CE 424, CE 425, CE 426.
Food Safety and Technology--Six of the following courses: FST 401, FST 402, FST 403, FST 404, FST 421, FST 475, FST 476, FST 484.

Forensic Science: CHEM 321, CHEM 334, CHEM 335, CHEM 423, SOC 245, ID 113 or ID 258.

Health Care and American Society: SOC 201, SOC 348, SOC 374, PS 351, PS 332 or SOC 301.

History: At least 15 credit hours must be completed, including at least 6 hours in European and 6 hours in American history on the 300 level or above.
Human Biology, Health, and Safety: BIOL 115, BIOL 116, BIOL 410, BIOL 425, BIOL 430.
Industrial and Scientific Photography: ID 107, ID 352, ID 354, ID 370, ID 372.

Industrial/Engineering Psychology: MSC 221, PSYC 201, PSYC 301, PSYC 409*, PSYC 456.

Information Systems: CS 325, CS 425, IS 326, IS 440, IS 445.
Law and Society--at least 15 credit hours must be completed, chosen from the following: MGT 221, PS 256, PS 318, SOC 348, SOC 245, PHIL 362.

Legal Studies: LAW 251, LAW 252, LAW 253, LAW 254, LAW 257, LAW 259, LAW 260.
Department of major studies and Chicago-Kent College of Law permission required. Permission is usually contingent upon an expectation of admission to the College of Law.
Literature at least 15 credit hours in 300-level English courses must be completed, including: ENGL 337 or ENGL 338 and at least two courses chosen from the sequence ENGL 371 through 374.

Logic and Philosophy of Science at least 15 credit hours must be completed, including: PHIL 340, PHIL 341, and at least three of the following courses: PHIL 326, PHIL 335, PHIL 342, PHIL 343, PHIL 344, PHIL 345, PHIL 346, PHIL 350.

Management: ACCT 130, ECON 211, MGT 351, OM 312 (ECON 211 and MGT 351 satisfy General Education requirements except for students in the Stuart School of Business) and one of the following: ACCT 131, ECON 212, MKT 371. Chemical engineering majors should also take CHE 426 or another engineering science course.

Management for Electrical Engineering Majors: ACCT 130, ECON 211, MGT 351, and two of the following: ACCT 131, ECON 212, ECON 423, MKT 371, OM 312, or OM 433.
Manufacturing Management: MSC 221, OM 312, OM 423, OM 425, OM 433.
Marketing: MKT 371, MKT 472, MKT 478 and two of the following: MKT 471, MKT 481, MKT 482, or MKT 483.

Materials Science: MS 101, METM 220 and at least 3 of the following: METM 305, METM 326, METM 328, METM 405, METM 427, METM 435, METM 440.
Mathematical Analysis: MATH 332, MATH 370, MATH 400, MATH 402, MATH 461 or MATH 488.

Mechanical Engineering (AE majors only): MAE 315, MAE 403, MAE 404, MAE 405, MAE 461, MAE 479.

Military Science: MILS 101, MILS 102, MILS 201, MILS 107 or MILS 202, (these courses will at times be interchanged); MILS 301*, MILS 302*, MILS 401*, MILS 402* (or attendance at military training).

Naval Science: NS 101, NS 102, NS 201, NS 202 (attendance at the Naval Science Institute may be substituted for these courses), NS 301 or NS 302, NS 310, or NS 311, NS 401, or NS 410 or MGT 351, NS 402 or NS 411.

Marine Option: NS 100, 102, 201, and 202 plus the following: NS 310, NS 311, NS 410, NS 411.

Numerical Methods: MATH 332, MATH 370, MATH 470, MATH 486, MATH 487 or MATH 488.
Organizational Psychology: PSYC 201, PSYC 301, PSYC 303, PSYC 310 or SOC 210, PSYC 409.

Philosophy--at least 15 credit hours must be completed, including: PHIL 301, PHIL 302, PHIL 305 and at least two additional philosophy courses numbered 300 or above.

Photographic Visualization Techniques: ID 113, ID 258, ID 352, ID 372, ID 422.
Political Science--at least 15 credit hours in political science must be completed, including at least nine hours above the 200 level.

Polymer Science and Engineering --CHE 450 and at least three courses from the following: CHE 492, CHE 538, CHE 555, CHE 575, CHE 581, CHEM 535, METM 480, METM 452, METM 581 and at least one course from the following: CHE 426, CHE 460, CHE 489, CHEM 423, CHEM 537, MAE 422, MAE 479, FST 404.

Pre-Social Service: MATH 221, PSYC 204, PSYC 303, PSYC 310 or SOC 210, PSYC 452. Probability and Statistics: MATH 332, MATH 475, MATH 476, MATH 482 or MATH 370, MATH 483.

Process Design and Operation --at least three courses from the following: CHE 426, CHE 431, CHE 437, CHE 507, CHE 508, CHE 528, CHE 530, CHE 560, MATH 486 and at least two courses from the following (only one of the ENVE offerings): CHE 402, CHE 430, CHE 455/557, CHE 461, CHE 465, CHE 489, CHE 492, ENVE 410, ENVE 450, ENVE 476, FST 403.

Product Design: ID 103* or ID 104*, ID 255 or ID 256, ID 312, ID 335, ID 360.

Programming Languages: CS 200, CS 325, CS 331, CS 350, CS 440.

Psychobiology: MSC 221, PSYC 201, PSYC 204, PSYC 414, PSYC 423.
Psychology--at least 15 credit hours must be completed, including the following three required courses: MSC 221, PSYC 201, PSYC 204.

Public Administration: PS 200 or PS 201 and PS 351, PS 452, PS 462, SOC 311.
Science and Technology in Context (STX)-at least 15 credit hours in 300- or 400-level STX courses.

Sociology: At least 15 credit hours must be completed, chosen in consultation with the chairman of the Department of Social Sciences.
Software Engineering: CS 200, CS 331, CS 350, CS 387, CS 487.

Statistics: MATH 332, MATH 475, MATH 476, MATH 483, MATH 482 or MATH 487.
Systems Programming/Operating Systems: CS 200, CS 350, CS 351, CS 450, CS 455.
Technical Communication for Management: CS 105, ENGL 421, ENGL 423, ENGL 427, ID 101, EG 225* and at least three credits from the following courses: ENGL 334, ENGL 335, ENGL 401, ENGL 425.

Technology and Human Affairs--at least 15 credit hours must be completed from the following: HIST 383, PHIL 370, PHIL 374, PS 332, PS 338, PS 339, SOC 303, SOC 362.

Toxicology: BIOL 107, BIOL 115, BIOL 403, BIOL 514*, ENVE 410, ENVE 463.
Urban Studies--Four of the following courses: HIST 350, HIST 352, PS 315, PS 316, PS 317, SOC 350 and SOC 346 or SOC 411.

* Departmental approval required.

UNDERGRADUATE ADMISSION

The university carefully evaluates candidates on a number of criteria. The Committee on Admission considers each application on its individual merits, always looking for superior ability as determined through previous academic records, recommendations, statements by the student, leadership experiences, aptitudes, and goals. The student's record of achievement in high school, however, most often provides the best prediction of success at IIT. Three-quarters of IIT freshmen come from the upper quarter of their high school classes, more than 90 percent of them from the top half. College entrance examinations such as the ACT and the SAT are used supportively in the admissions decision-making process.

Student Classification and Admission Procedures

Full Time--All students formally admitted by the Office of Admission to a degree program and registering for 12 or more credit hours, as well as all co-op students, are classified as full-time students. Students must be admitted prior to registration. For application forms, instructions, and specific information, contact the Director of Admission, Illinois Institute of Technology, 10 W. 33rd St., Chicago, IL 60616. Phone (312) 567-3025.

Part Time--All students registering for courses not exceeding 11 credit hours are classified as part-time students. Many IIT degree programs can be completed through evening classes on a part-time basis. All new part-time undergraduate students, whether degree-seeking or non-degree, must be admitted by the Office of Educational Services prior to registration. For application forms, instructions, and specific information, contact the Office of Educational Services, Illinois Institute of Technology, 3300 S. Federal St., Chicago, IL 60616. Phone (312) 567-3300. Full-time requirements apply to all degree-seeking students regardless of full- or part-time status. See page 36 for nondegree student requirements.

Freshman Requirements

High School Requirements

Graduates from an accredited high school applying for admission must present evidence that they have completed a minimum of 16 units of high school work; most admitted students exceed this minimum. A ``unit'' may be defined broadly as the study of a major subject for one academic year in high school. Because of new and revised courses in many of the high school curricula, the numbers listed here are guides rather than exact measurements and are based on the traditional Carnegie unit system.

1. The minimum units required for the engineering programs and the programs in architecture, biology, chemistry, computer science, mathematics, physics, and psychology (B.S. program) are:

English	4
History or Social Sciences	1
Mathematics	
Algebra	2
Geometry	1
Trigonometry	
Laboratory Science	2

(Physics and chemistry are recommended.)

2. The minimum units required for all other programs in the university, including business, design, English, history, philosophy, political science, psychology (B.A. program), and sociology are:

English	4
*History or Social Sciences	1
*Mathematics	
*Algebra	2
*Geometry	1
*Laboratory Science	1

High school studies should provide a sound background for college study. Preparation in mathematics, for example, must have sufficient depth in geometry, trigonometry, and especially in

algebra, to permit applicants for science and engineering programs to begin immediately the study of college-level calculus and analytic geometry.

A background in English must prepare a student to write well and to read intelligently and analytically, with depth and sensitivity of comprehension.

Official high school transcripts should be forwarded directly to IIT by the applicant's guidance counselor. A full-time applicant should also submit a school teacher recommendation.

Entrance Examinations
All degree-seeking candidates for admission to the freshman class are required to take the College Entrance Examination Board's Scholastic Aptitude Test (SAT) or the American College Test (ACT). The tests may be taken in the student's junior or senior year, preferably by the December testing date in the senior year. Applicants for admission in January must have taken the SAT or the ACT by the preceding November. Permanent residents who have not attended an American high school or college for at least two years must also take the Test of English as a Foreign Language (TOEFL) and score at least 550.

* Students who wish to enter the business program are encouraged to take 3 units in mathematics (1 unit of elementary algebra, 1 unit of advanced algebra, 1 unit of geometry, and unit of trigonometry).

Transfer Credit
Applicants should consult their high school counseling offices or testing companies directly for details regarding test dates, times, costs, etc., and arrange to have official reports of their scores sent to the IIT Admission Office.

Addresses:
SAT and Achievement Tests
TOEFL ACT
College Board ATP
P.O. Box 899

ACT Registration
P. O. Box 592 Princeton
Princeton, N.J. 08541
P. O. Box 414 Iowa City,
Iowa 52243

Advanced Placement Program
Some high schools offer courses at the college level for advanced students. Secondary school students requesting advanced placement, or placement and credit, as a result of advanced courses taken in high school, should take the College Entrance Examination Board's Advanced Placement examinations given in May. The awarding of Advanced Placement credit varies by department. Please check with the Office of Admission for more details.

Transfer Student Requirements
Students who have taken coursework at a community college or at a four-year college or university and who wish to transfer to IIT must supply official transcripts of their high school and college records. Transfer applicants are expected to be in good standing at their previous colleges. Students who have attended college for less than two academic years should take the SAT or ACT if they have not already done so.

Permanent residents who have attended United States high schools or colleges for less than two academic years must also take the Test of English as a Foreign Language (TOEFL) and score at least 550. Other evidence of English competency is required in addition to TOEFL.

Transfer applicants must supply official transcripts, along with any other necessary supporting documents, of all academic work previously attempted when they apply. Incomplete applications could result in a delay of the evaluation of transfer credit, or forfeiture of credit for work not submitted, as well as possible cancellation of admission.

Transfer Credit
Courses may be acceptable for transfer credit from other accredited institutions of higher education provided they are comparable in nature, content, and level to those offered at IIT and the grades are the equivalent of a ``C'' or higher. A maximum of 68 applicable transfer credit hours is permitted from a two-year institution.

Once enrolled at IIT, in order to receive transfer credit for a course taken at another institution, an undergraduate degree-seeking student must submit a formal petition in the Office of Educational Services and receive approval from the Academic Standing Committee prior to registration for the course.

The final 45 credit hours of work must be completed at IIT. See section on ``Residence Requirements'' on page 58 in this Bulletin for further information.

Nondegree Student Requirements
Applicants wishing to enroll in undergraduate courses solely for professional development, for the purpose of removing deficiencies in order to meet graduate admissions requirements, or to complete the requirements for a degree at another school, may apply as nondegree students. Applicants in this category will be restricted to part-time enrollment.

Students who are taking selected courses for professional advancement or to remove deficiencies before being admitted to a graduate program must submit at least a completed application and an official transcript of their most recent academic work. Depending on the courses selected, additional credentials may be requested.

International Student Requirements
IIT welcomes international student applications. International students intending to enroll with a student visa must register for a full-time load of 12 or more credit hours. The undergraduate admission criteria for international students are as follows:

1 A good secondary school record.

2. TOEFL (Test of English as a Foreign Language) results of at least 550.

3. An official affidavit of financial support showing adequate funding for one year.

4. Original or certified copies of all documents. (Certified English translations of foreign language documents must be provided.)

5. Additional information as required to assist the Committee on Admission in its evaluation.

International students may transfer to IIT from an accredited institution of higher learning if they meet the admissions requirements and are in good standing at their previous school. Please see Transfer Student Requirements.''

Procedure For Application

IIT offers two options for applying for admission: Early Review and Regular Review. Applicants will be considered after May 15 on a space-available basis. By choosing when to apply, students determine when IIT notifies them about admission. Students are urged to apply under the Early Review option if IIT is their first choice. And, because Financial Aid funds are limited, it is suggested that students apply for financial assistance as early as possible. Please choose application dates carefully.

Admission Notification and Financial Aid Timetable

	Early Review	Regular Review
Applications & Credentials Submitted by AT2, Financial Aid Form	December 1	March 15

(FAF) due by:	February 15	March 15
IIT mails admission decision letter by:	January 15	April 1
Financial Aid decision mailed by:	April 1	April 1
$100 Confirmation Deposit due by:	May 1	May 1

All candidates for double degree studies (page 26) must apply under Early Review. Applications for spring semester should be submitted no later than December 1. International students should submit complete applications by June 1 for fall enrollment and October 1 for spring enrollment.

Complete application credentials consist of an official IIT application, transcripts of all academic work completed, ACT or SAT scores, and a $30 application fee submitted by the published deadlines. High school applicants are encouraged to submit their credentials immediately following their junior years. Architecture majors can enroll for the first time in the fall semester only.

Transfer students should apply before the end of the semester prior to their intended enrollment at IIT. Early application, however, is strongly encouraged so that transfer credit can be evaluated before registration. Complete credentials must be submitted by published deadlines for each semester. The nonrefundable application fee for transfer applicants is also $30.

IIT admission application forms are available from IIT's Office of Admission. Call, write, or stop in to request this material. The office is in Room 101, Perlstein Hall, 10 West 33rd Street, Chicago, Illinois 60616-3793. The phone number is (312) 567-3025. Out-of-state applicants can call toll-free 1-800/448-2329.

Students are strongly encouraged to schedule admission interviews to discuss education and career plans with IIT admission counselors or with IIT Alumni Admission Council members near their homes.

Arrangements for interviews, campus tours, overnight stays, career counseling, or appointments with faculty in intended majors can be made through the Office of Admission.

All full-time degree-seeking students admitted to the university must pay a tuition pre-payment of $100. This is a student's confirmation of his or her intent to enroll at IIT. This amount is applied to the cost of the first semester's tuition. The confirmation deposit holds a place in class for a student in the initial semester of enrollment; therefore, it is important to pay the fee as soon as possible following notice of admission.

Priority Processing Guidelines for Admission Applications

Students should submit complete admission credentials (official transcripts, admissions application, application fee, test scores, and recommendations) by March 15 for the following fall semester. Students initiating admission procedures after that time should stay in touch with the Offices of Admission and Financial Aid regarding their status. Please note in the calendar section of this publication the dates for registration.

International students applying to the university for the first time must submit their admission credentials to the Office of Admission by June 1 for the following fall semester or by October 1 for the following spring semester.

Reinstatement To The University

Former IIT students who want to reenter IIT as full-time or part-time undergraduate students must submit an application for reinstatement to the Office of Educational Services, Room 101, Main Building, 3300 S. Federal St., Chicago, IL 60616-3793. For further information, call (312) 567-3300.

Applications from all students seeking reinstatement must be submitted no later than two weeks prior to the week of registration for the semester of intended enrollment. No fee is required. Students who have attended other schools since their last attendance at IIT must also submit

appropriate transcripts by this time. Students who have not previously done so may also be required to provide proof of immunization.

International students seeking to be reinstated with a student visa must also contact the International Students and Scholars Center, 103 Farr Hall, 3300 S. Michigan Ave., Chicago, IL 60616-3793. Phone (312) 808-7105.

Immunization Requirement

In accordance with Illinois law all students born on or after January 1, 1957, and enrolling at IIT for the first time after July 1, 1989, must supply health provider documented evidence of vaccination for diphtheria, tetanus, measles, rubella, and mumps. Transfer students are considered as first-time enrolled students. Students enrolling for the first time during a summer session may be permitted to enroll in the subsequent fall term before providing proof of immunity. Students who wish to enroll only in one class per semester or via IITV at corporate sites may file a written request for an exemption. Exemption from one or more of the specific requirements may also be granted based on documented medical or religious reasons.

A student who fails to provide acceptable evidence of immunity shall be prevented from registering for classes in the next semester. Questions regarding medical aspects to the policy should be directed to: Counseling and Health Service Office at (312) 808-7100; administrative questions should be directed to the Office of Educational Services at (312) 567-8981.

FINANCIAL AID

The purpose of IIT's financial aid and scholarship program is to provide resources for those students who are capable of earning an IIT degree. IIT's philosophy is one of service to individuals, and this philosophy is present in the operation of the financial aid and scholarship program.

The Student Finance Center administers a comprehensive financial aid program of loans, work, scholarships, and grants for full-time undergraduate students. In determining financial need, IIT subscribes to the nationally recognized formula of need analysis; Student Finance Center personnel review all information provided by the student and the family in an effort to match the award with the student's computed financial need.

Computing Financial Need

The first step in computing financial need is the construction of a comprehensive budget that reasonably reflects the entire cost of attending IIT. In addition to tuition and room and board, the budget should include allowances for books, transportation, and modest personal expenses.

IIT uses a base room and board budget equal to the lowest cost for a single person living on campus. Each student is expected to contribute some earnings from summer or other employment to the amount included in the budget beyond tuition and room and board.

Eligibility For Financial Aid

Students enrolled on a full-time basis (12 credit hours or more) and paying full-time tuition are eligible to be considered for federal, state, and university financial aid awarded by IIT.
IIT offers limited academic scholarship assistance to international students.
Degree-seeking students enrolled on a part-time basis may qualify for assistance from some federal financial aid programs.
For up-to-date information, consult a counselor in the Student Finance Center, Room 212, Main Building, (312) 567-3303.

Application Process

New Freshman Students

Freshmen seeking to enter IIT must submit a 1993-94 or 1994-95 Financial Aid Form (FAF) and the Free Application for Federal Student Aid (FAFSA) to IIT through the College Scholarship Service (CSS). The form is available from high schools and from IIT's Office of Admission and Student Finance Center. All are required to complete the IIT Application for Financial Aid (available at the Student Finance Center). These forms provide IIT with information necessary for needs analysis. The priority date for financial aid consideration is based on the date all required forms are received by the Student Finance Center. Freshmen are urged to complete all application materials by April 15 of the year for which they are seeking fall admission.

New Transfer Students

Transfer students seeking to enter IIT should follow the instructions given above. Transfer students are also required to submit a financial aid transcript from each college previously attended whether financial aid was received or not. These financial aid transcript forms are available in the IIT Student Finance Center.

Continuing Students

Application materials are available in the IIT Student Finance Center after January 1.

All Students

The FAF and the FAFSA should be filed as early as possible after January 1, 1994 (1995), or immediately following completion of 1993 (1994) income tax returns. In order that financial aid requests be given full consideration, all applications should be on file in the Student Finance Center by April 15. New students should therefore not wait until a final admission decision is given before filing an FAF and FAFSA.

Because financial aid is awarded only on an annual basis, students should be aware that new applications must be filed each year. The amount of financial aid awarded each year will depend on the demonstrated need of the applicant and available funds.

Federally Supported Financial Aid Programs

Federal Pell Grant

Established under the federal Education Amendments of 1972, these grants are based on financial need as determined by a federally approved formula. Applicants should note, however, that even if they are ineligible for Pell Grants, extremely high financial need might still be met with other sources of financial aid. Therefore, all students must turn in their Pell Grant Student Aid Reports to the Student Finance Center. Students may apply for a Pell Grant by using the FAFSA. The maximum grant in 1993-94 was $2,300.

Federal Supplemental Educational Opportunity Grant (FSEOG)

Established in 1965, this program provides gift aid to exceptionally needy students. Students may apply for a FSEOG by completing the FAFSA.

Federal Perkins Loan

Formerly the National Direct Student Loan (NDSL), this program provides long-term, low-interest loans to students who demonstrate financial need. When students leave IIT, repayment begins after a nine-month, interest-free grace period at an annual 5 percent simple interest rate. Payments are due thereafter on a quarterly basis. Students who are planning to enter secondary teaching should note the cancellation provisions included on the promissory note. Awards are made to students through IIT.

Federal Work Study Program

Established under the Economic Opportunity Act of 1964, this program provides resources to universities to support additional student employment opportunities both on and off campus. To be eligible for the program, students must demonstrate financial need. Students employed under the FWS program are not permitted to work more than 20 hours per week during the academic term, more than one job on campus, or duing scheduled class times.

Federal Stafford Loan

This program is a cooperative effort of private lending institutions, and the federal government offering low-interest, long-term educational loans to qualified students. Further information may be obtained from the Student Finance Center.

State-Supported Financial Aid Programs

Illinois Student Assistance Commission Monetary Award

This program provides gift aid, based on financial need, to Illinois residents to attend Illinois colleges. The maximum award for 1993-94 to attend IIT was $3,500. Illinois students must apply for a Pell Grant in order to be considered for an ISAC monetary award, since the ISAC receives its data directly from the Pell Grant processor. The ISAC will then notify students of their award amounts.

University-Supported Financial Aid Programs

More than 80 percent of IIT students receive financial assistance. In assessing financial need, family circumstances as well as family income are considered. When applying for financial aid, students are considered for all applicable scholarships. IIT's comprehensive financial aid program also recognizes merit. Each year a number of talented students receive IIT grant assistance even though they do not require much or any financial aid.

IIT Grants

These grants are university funded and are awarded on the basis of need. IIT Grants are awarded at the discretion of IIT.

Transfer Student Scholarships

$1,000 to $3,000 merit awards are made to transfer students from Illinois public community colleges who have strong college and high school records. Awards are renewable based on grade point average at IIT. Application deadline is April 15.

Athletic Scholarships
As an N.A.I.A. member, IIT awards athletic scholarships based solely on athletic ability, regardless of need. In compliance with N.A.I.A. rules, athletic scholarships are officially made by the director of the Student Finance Center, upon recommendation of the athletic director. Recipients are not precluded from receiving additional need-based financial aid, if additional financial need is demonstrated.

IIT Endowed Scholarships
These scholarships are made possible through donations by individuals, corporations, and foundations. For descriptions and information regarding availability of endowed scholarships, contact the Student Finance Center.

University Loans
Loans are available to undergraduate students demonstrating financial need. For more information contact the Student Finance Center.

Part-Time Employment
Part-time employment is available on campus (on a non-FWS basis). Students interested in off campus employment in the greater Chicago area may contact Career Services in Farr Hall.

Career Services
See page 8 of this Bulletin for information on Career Services programs to assist students in finding job opportunities.

ROTC Programs
The U.S. Air Force, Army, and Navy offer ROTC scholarships. For details, consult the section on ROTC Programs in this Bulletin.

Veterans' Educational Benefits and Social Security Benefits
The Office of Student Records and Registration, Room 104, Main Building, (312) 567-3310, helps students complete forms certifying enrollment so that eligible students can receive their veterans' and/or social security benefits to attend IIT.

Privately Supported Financial Aid Programs

National Merit and National Achievement Programs
IIT sponsors both the National Merit and National Achievement Scholarship Programs. Students who qualify as finalists for one of these awards and list IIT as their first choice are assured of receiving an award from IIT. IIT will sponsor all finalists who have not obtained a corporate/business sponsor.

The annual competition for these merit awards begins with the PSAT/ NMSQT exam in October of the student's junior year of high school. In September of the student's senior year, National Merit Program semifinalists are announced. To become a finalist, each semifinalist must meet additional requirements that include being endorsed and recommended for merit scholarship consideration by the high school principal, substantiating PSAT/NMSQT exam scores by an equivalent performance on the Scholastic Aptitude Test (SAT), and submitting evidence of high academic standing in his or her high school class. Finalist determination is completed in January of the senior year.

Sponsored Scholarships
Qualified applicants are automatically considered for sponsored scholarships administered by IIT, its departments, and programs. Students are encouraged to contact their high school guidance counselors about local scholarships for which they might be eligible to apply. For more information contact the Student Finance Center.

Continuation of Financial Aid
Continuation of student financial aid is contingent on the demonstration of reasonable progress as stipulated in the IIT Financial Aid Reasonable Progress Policy. The policy has been created in compliance with state and federal regulations governing the awarding of financial aid from those sources. The purpose of the policy is to ensure that students receiving state and federal financial

aid make reasonable progress toward graduation. Reasonable progress includes both a satisfactory cumulative and major grade point average and adequate credit hours earned. Failure to comply with these two requirements will lead to the loss of financial aid. You may request a copy of the IIT Financial Aid Reasonable Progress Policy from the Student Finance Center, Room 212, Main Building, (312) 567-3303. Office hours are 8:30 a.m. to 5:00 p.m., Monday, Tuesday, Thursday, and Friday.

EXPENSES

Tuition and Deposits

Application Fee

All formal applications for admission must be accompanied by a fee of $30, which will not be refunded.

Undergraduate Tuition

IIT's tuition plan allows full-time undergraduate students to take as many courses as they wish during the regular academic year and pay no tuition for summer school. Tuition for full-time undergraduates is $13,750 for the 1993-94 academic year. Part-time undergraduate students (those taking fewer than 12 credit hours) will be charged at the rate of $430 per credit hour. Tuition for courses taken by part-time undergraduate students that are offered by the Stuart School of Business will be $300 per credit hour for the first six hours of Business School courses taken during the semester. If more than six hours of Stuart School courses are taken, all credit hours will be charged at the normal undergraduate per credit hour rate of $430.

Alumed Program

IIT and Midwest College of Engineering graduates are permitted to register as part-time undergraduate or graduate students for one course each semester at a reduced tuition rate. Authorization must be obtained from the Office of Educational Services, Room 101, Main Building, (312) 567-3300, after which a tuition credit voucher will be issued. Alumni must present the tuition credit voucher and pay the remainder of tuition charges at the time of registration. Tuition credit vouchers must be requested prior to the day of registration. Only one course per semester at half tuition will be permitted for alumni registering as undergraduates. Courses completed may be used for credit toward either a second undergraduate degree or an advanced degree at IIT. Registration for credit courses only is permitted excluding short courses, special problems, research and thesis, or intersession courses. A reduced tuition rate is also available for graduate students.

Alumni must register as part-time undergraduate or graduate students. Alumni registering as full-time students or as students in a law school degree program are not eligible.

The Alumed Program cannot be applied retroactively; requests for vouchers for prior semesters will not be honored.

Payment of Tuition, Fees, Room and Board

IIT's Pre-payment Option and Extended Payment Plan for payment of Tuition and Room and Board are described in the current Bulletin: Schedule of Classes. Or, contact the Bursar's Office, Illinois Institute of Technology, 207 Main Building, 3300 S. Federal St., Chicago, IL 60616. Phone:(312) 567-3320.

Outstanding Debts

A financial hold is placed on a student's record when that student is delinquent in fulfilling his or her financial obligation to the university. A student will be considered delinquent when his or her account is not current according to established payment due dates listed in the Bulletin: Schedule of Classes. Students with outstanding debts may be suspended from current semester classes until the amount due is paid. Students whose accounts are not current will not be allowed to register until all outstanding indebtedness is cleared. No certificates of attendance or transcripts of academic records will be issued until all financial obligations have been met.

Payment of amounts due may be made by check, money order, MasterCard, or Visa payable to Illinois Institute of Technology. Payments made by check or money order should be mailed to:

Illinois Institute of Technology
P. O. Box 95152
Chicago, IL 60694

Refunds of Tuition

A cash refund of tuition paid may be issued only if the student's written application for withdrawal is received in proper form by the Office of Student Records and Registration within the prescribed

time and with reason satisfactory to the appropriate dean. The date such application is received by the Office of Student Records and Registration will constitute the official date of withdrawal and the amount of the refund will be based on the schedule published in the current Bulletin: Schedule of Classes.

No tuition will be charged, and full cash refund will be made on any amounts paid, upon application supported by proof as necessary, under the following circumstances:

1. If a course for which the student is registered is canceled by the university.

2 If a student's death or serious injury causing incapacity occurs before the end of the fourth week.

3. If a part-time student who has registered by mail submits his or her withdrawal to the Office of Student Records and Registration prior to the start of classes.

Under other exceptional circumstances, such as withdrawal for voluntary military service, serious illness, or action by the university, consideration may be given for a pro-rata refund or credit for unused tuition upon written request to the bursar.

Other Academic Expenses
All charges listed herein are for the 1993-94 academic year and are subject to change without notice. The university regrets that continually rising costs do not permit it to guarantee that published charges will not change. Students and parents are cautioned to anticipate periodic increases in the years ahead.

Confirmation Deposit
Each student admitted as a degree-seeking undergraduate is required to make a $100 tuition prepayment, which is a down payment on the student's tuition and holds his or her place in class for the initial semester of enrollment.

Student Health Insurance
All students are required to purchase the basic student health insurance policy or to submit proof of equivalent insurance. This requirement applies to students who are either:
* registered for 12 or more credit hours;
* participants in the co-op program;
* considered full-time by their departments;
* research or teaching assistants; or
* occupants of IIT residence halls.

The premium for the basic insurance program will be added to student tuition and fees by the third billing cycle (usually eight to nine weeks into the semester) as a charge. To avoid this charge, submit a valid declination to the plan's underwriters by the dates listed in the Insurance Brochure issued at registration. Once a declination is accepted it will be valid throughout the academic year.

Other students, spouses, and dependents of students may participate in the student health program, if desired. Consult Counseling and Health Service in Farr Hall, (312) 808-8100, for further details.

Student Activity Fee
A fee of $20 for full-time students and $1 per credit hour for part-time students will be charged each semester. This applies only to students at the Main Campus.

Parking Fee
All students parking on campus parking lots must register their cars with the Campus Police Department in Farr Hall and pay a parking fee. The $20 per semester fee can be paid at the beginning of each semester, or students can pay $30 at the beginning of the fall semester for the full academic year. Students authorized to park on IIT's lots will receive parking permits and plastic cards that open the control gates.

Special Fees

These are fees for special services and are charged only if incurred.

Late registration $	25.00
Special examination (per credit hour	100.00
Returned check fee	25.00
Breakage deposit (For students taking laboratory courses in biology or chemistry)	25.00

Books and Supplies

Books and other supplies are available at Follett's Commons Bookstore. Their costs differ widely, depending upon the field of study. Students in Armour College of Engineering and Science, Lewis College of Liberal Arts, and Stuart School of Business can expect to spend approximately $500 per year for books and supplies (exclusive of drafting equipment and similar one-time purchases). Students in the College of Architecture and the Institute of Design may spend less on books but substantially more on supplies (between $650 and $750); a 35mm camera is required for architecture majors.

Living Expenses

Unmarried Students

The university's residence halls provide facilities for room and board for undergraduate and graduate men and women. Freshmen not living with their families must live in the residence halls or in fraternity houses. Exceptions to this rule may be granted by the dean of students. Residence hall contracts are made for the full academic year, from the beginning of orientation in August until commencement in May.

The charges for room and board for new students range from $4,440 to $5,640 for an academic year. When a student applies for housing accommodations, an itemized list of available housing facilities and rates will be furnished.

Meals

A 21-meals-per-week, a 15-flex, or a 15 PLUS board plan is required. Meals are available to nonresidents on a cash basis.

Payment of Room and Board Charges

A $50 security deposit is required at the time a room application is submitted. An initial $150 nonrefundable payment, which applies in full to charges for room and board, must be submitted to the director of housing by July 1 for fall semester applicants or December 1 for spring semester applicants. One-half of the room and board charge for the academic year is payable each semester.

Commuting Students

A student living at home and commuting will spend an estimated average of $1,200 on living costs at home and for meals on campus and approximately $500 for travel.

Miscellaneous Expenses

Miscellaneous personal and recreational expenses are estimated at $650 for the academic year. These figures are used in computing the official financial aid budget.

Married Students

There are 356 living units in four high-rise apartment buildings on campus. These units range from efficiency to three-bedroom apartments. Leases typically are signed on an annual basis and are available to full-time faculty, staff, married students, and single full-time graduate students if space is available. Rentals, including all utilities except telephone, range from approximately $385 to $780 per month, unfurnished. Furnished apartments also are available. Applications for campus housing should be submitted to the director of housing well in advance. A $35 application fee is required when applying for an apartment.

ACADEMIC INFORMATION AND REGULATIONS

Academic Loads

The average full-time academic load during the fall or spring semester is 15-18 credit hours. The minimum registration required for full-time status during those semesters is 12 credit hours. During the summer session, six credit hours is regarded as full-time enrollment for financial aid consideration. Students who wish to enroll for more than 18 credit hours during the fall or spring semester must obtain permission from the deans of their schools or colleges. Part-time degree-seeking students wishing to register for 9 to 11 credit hours require written permission from the deans of their schools or colleges.

Students who wish to change their class schedules need to apply at the Office of Student Records and Registration for the necessary forms. Changes can only be made according to the deadlines stated in the IIT Bulletin: Schedule of Classes.

Academic Program Audit

An audit provides a summary of a student's academic status to date, specifying all deficiencies that need to be removed before he or she is eligible to receive a degree.

All undergraduate students who have completed a total of 60 semester hours of credit (90 semester hours for architecture students) must request academic program audits. Students in Lewis College of Liberal Arts and Stuart School of Business must consult with their advisers and file an Approved Program of Study. Students in all other curricula complete Academic Program Audit Request forms available from the Office of Educational Services, Room 101, Main Building, (312) 567-3300, returning completed forms to that office. Failure to request academic audits on time may delay graduation.

Academic Progress, Probation, and Dismissal

All students who are degree candidates are expected to maintain satisfactory grade-point averages and satisfactory rates of progress toward the completion of their degree programs.

Students who do not maintain at least 2.00 cumulative and 1.85 current grade point averages and 2.0 cumulative averages in their major fields will be placed on academic probation. Their eligibility for financial aid will also be reviewed (see page 45). If, in the next semester of registration, these above standards are not met, students may continue within their colleges only with the permission of their deans. They may apply to another college within the university, but if they are not admitted, they may be subject to dismissal from IIT.

Degree-seeking students are expected to maintain satisfactory rates of progress. For full-time students this means a minimum of 12 credit hours per semester or a minimum 20 credit hours per academic year applicable to their degrees. For part-time students, satisfactory rates of progress will enable them to graduate within 12 academic years after achieving degree-seeking status. Students who do not maintain satisfactory rates of progress over a period of two semesters will be placed on probation and may continue within their colleges only with the permission of their deans.

Students on probation are not permitted to:

1. Register for more than 15 credit hours per semester.

2. Hold office in any student organization.

3. Represent the university on any athletic team, student organization, or committee.

The progress of nondegree part-time students is also reviewed, and any such students failing to maintain an acceptable record are also subject to being placed on probation or being dismissed.

Students dismissed by the university can be reinstated by action of the Academic Standing Committee subject to the approval of the deans of their colleges. Students must present substantial academic or other relevant new evidence not available at the time of dismissal in

support of reinstatement. Application for reinstatement should be made at least two weeks before the start of registration for the desired semester of attendance.

Academic Standing Committee
A student may request through the Office of Educational Services (Main Building, Room 101, 312-567-3300) that the Committee on Academic Standing reconsider or review decisions on academic status. This includes enforcement of standards for academic standing, decisions on dismissal for academic reasons, the enforcement of graduation requirements, the application of rules governing transfer credit, the accuracy of information included on transcripts, and related academic matters.

Associate and Assistant Deans
Associate and assistant deans of colleges act as the initial contacts for the college deans. They are the main source of information on college policies and are responsible for most student records. They can screen and pass judgment on most appeals related to academic matters. The associate and assistant deans are members of the Academic Standing Committee (above).

Change of Major
A student who wishes to change majors should obtain a change-of-major request form from the Office of Student Records and Registration and get written permission from the chairman of the intended major department and respective dean of the college.

Change of Status
Students who wish to change their classifications and/or registration status must complete the applicable procedures listed below no later than two weeks prior to registration (or preregistration).

Full-time to Part-time (Degree-seeking)
Notify the Student Finance Center, if applicable. Students on academic probation will also need the written approval of their academic deans. International students with student visas must be registered as full-time students.

Part-time (Degree-seeking) to Full-time
Part-time students who have already been approved for regular, degree-seeking status (identified as classification U1 through U10) may register for full-time course loads following normal procedures and securing necessary advisers' approvals. Students in this category who wish to apply for financial aid must notify the Student Finance Center regarding their changes of status.

Graduate to Undergraduate (Full-time or Part-time)

Visit the Office of Educational Services.
Part-time (Nondegree) to Full-time or Part-time (Degree-seeking)
A part-time nondegree student may remain in this status for no more than 30 completed credit hours, including transfer credit hours. Regardless of the number of credit hours completed, however, each student must satisfactorily complete at least one semester at IIT prior to requesting degree-seeking student status. Applications may be obtained from the Office of Educational Services and are to be submitted at least four weeks prior to registration or preregistration, whichever is applicable.

Class Attendance
All students are expected to attend their classes regularly. When illness or emergency requires an absence for more than two days of classes, notify the dean of students in writing. Excessive absences may be grounds for receiving a failing grade.

Credit by Examination
Credit may be earned through one or more of the following examination procedures. Total credit from Proficiency Examinations and CLEP (not including advanced placement) may not exceed 18 credit hours.

Advanced Placement Program
Refer to the section on admission, page 36.

Proficiency Examinations
Any student who believes that through self-study or outside experience he or she has gained the substantive equivalent of the content of a particular course may petition for an examination. With the approval of the student's adviser and the dean of the college granting the credit, a proficiency examination will be administered. A letter grade is then entered on the permanent record. Proficiency examinations are not allowed for courses in which the student has previously enrolled. Proficiency examinations must be completed before a student's final 45 semester hours of enrollment at IIT. A fee of $100/credit hour is charged for each examination.

College Level Examination Program (CLEP)

For these examinations, which are administered by the College Entrance Examination Board, IIT will award credit under the following conditions:

1. The CLEP examination and the score achieved meet the standards of the IIT department that offers courses in the area of the examination.

2. The CLEP examination is taken before the student enters IIT.

3. A minimum of one year has elapsed between graduation from high school and the taking of the CLEP examination.

Note: Previous acceptance of the examination by another institution does not imply acceptance by IIT.

The Dean's List
The names of all undergraduate students who have completed at least 12 graded hours with a semester grade point average of 3.0 or better appear on the Dean's List, which is compiled each semester by the deans of the colleges.

Faculty Advisers
Each IIT undergraduate is assigned to a faculty adviser, who is available to discuss opportunities and career plans in the student's chosen field and to plan and approve coursework to meet department and college requirements. Students are urged to consult their advisers often.

Free Period
No classes are scheduled during the ``free period'' from noon to 2 p.m. on Tuesdays and Thursdays. This time is open for student meetings, ROTC, and intramural sports.

Grades
The following grades are used to report the quality of an undergraduate's work.
A Excellent, 4 grade points for each semester hour.
B Good, 3 grade points for each semester hour.
C Satisfactory, 2 grade points for each semester hour.
D Minimal Passing, 1 grade point for each semester hour.
E Failure, 0 grade point for each semester hour.
W Withdraw. To withdraw from a course with a grade of ``W'', submit a withdrawal form to the Office of Student Records and Registration before the end of the 10th week of the semester (the sixth week of an eight-week summer session and the fourth week of a six-week session). Withdrawal without submission of this form is unofficial and will result in a grade of "E." Note: Withdrawal with a grade of ``W'' is not possible for a student who has been assigned a failing grade because of academic dishonesty.
X Audit. A student may, with the instructor's written permission, register to audit a course. There is no credit given for an audited course. Courses may not be changed to or from audit after registration. Regular tuition rates apply.

Grades

I Incomplete Work. The ``I'' grade indicates that the student's work to date is of passing quality but is incomplete for reasons acceptable to the instructor. A grade of ``I'' will be assigned only in case of illness or for unusual or unforeseeable circumstances that were not encountered by other students in the class and that prevent the student from completing the course requirements by the end of the semester. The student should also have a substantial equity in the course, with no more than four weeks of classroom work remaining to be completed. Prior to assignment of the ``I'' grade, a written agreement will be reached with the instructor concerning the work still outstanding. A grade of incomplete may be removed with the approval of the department chairman and appropriate academic dean, after all remaining work is completed and the instructor assigns a regular grade. The work must be completed by no later than the end of the sixth week of class of the next regular (fall or spring) semester. If by that date no regular grade has been received in the Office of Student Records and Registration, the incomplete grade will revert to a grade of E.''

P Pass. For designated courses only. ``P'' grades are not used in the calculation of grade point average.

Retaking Courses

Students may repeat a course for a change of grade. To repeat a course for a change of grade, notify the registrar at the time of registration. Forms may be obtained in the Office of Student Records and Registration if registering by mail or at arena registration if registering in person. Re-registration for courses in which a student received a passing grade requires the approval of the student's adviser and the dean of the student's college. A course repeated for change of grade must be taken within one calendar year after initial enrollment in that course or the next time it is offered (whichever is longer). No more than three courses may be repeated for grade changes.

Both grades will be recorded on all transcripts issued. However, only the second grade will be used to compute the cumulative GPA, even if the second grade is lower, except when the second grade is ``W'' or ``X.'' If a course is no longer offered by the university, the provision to retake the course for a grade change does not apply. The same course may be repeated only once for a change in grade.

Graduate Courses

Undergraduate students enrolled in graduate-level courses are expected to meet graduate school standards. Work done in such courses must be of graduate quality and will receive the appropriate graduate grade (A, B, C, E, etc.). Only degree-seeking undergraduates may seek approval to register for graduate-level courses.

Grade Point Average

To determine grade point average (GPA), divide the total number of grade points earned by the total number of graded semester hours. Note that graded semester hours do not include course registrations graded ``P,'' ``I,'' ``W,'' or ``X.'' All courses taken at IIT apply to the GPA, including those that do not apply toward graduation.

Graduate Course Enrollment Approval for Undergraduates

An undergraduate degree-seeking student who wishes to enroll in a graduate 500-level course must first obtain a memo of approval from the course instructor stating that the student is qualified. This memo, in addition to the signature of the faculty adviser (or appropriate college dean if the adviser is unavailable), must be presented at the time of registration. An undergraduate nondegree student is not permitted to enroll in any graduate 500-level course. Undergraduate degree-seeking students who enroll in graduate courses are governed by the graduate grading system for those courses.

Graduation Requirements

The student is responsible for fulfilling graduation requirements as specified in the IIT Bulletin in effect at the time of his or her admission to IIT.

In the event that curriculum requirements change before the student completes a specified degree program, he or she may follow a curriculum in a subsequent IIT Bulletin with the approval of the relevant department chairman and academic dean.

The student has the ultimate responsibility to fulfill degree requirements, to attain eligibility to enroll in particular courses, and to comply with all applicable academic rules governing his or her individual academic program.

When an earlier curriculum is no longer available, the individual degree program of a student who has been following this earlier curriculum will be modified accordingly by the relevant department chairman and college dean.

Note: Students must file Application for Graduation forms with the Office of Educational Services at the beginning of the semester in which they plan to graduate. Failure to do so will result in the postponement of a student's graduation. Refer to the IIT calendar for specific deadlines.

To graduate, students in all undergraduate curricula must complete:

1. Departmental curriculum as listed under various departmental headings.

2. Credit hour requirements as appropriate to the various curricula (a minimum of 126 hours).

3. General Education requirements as outlined on page 18.

4. Residence requirements as outlined on page 56.

Other graduation requirements are:

5. A minimum cumulative grade point average of 2.00 and a minimum grade point average of 2.00 in the student's major department courses. A student who completes all course requirements with an average below the minimum grade point requirements may, with permission of his or her department chairman and academic dean, be able to take additional courses to raise the grade point average.

6. Completion of all the above within a period of eight calendar years from the semester of initial admission for full-time students or twelve calendar years for part-time students after achieving degree-seeking status. A student may petition the major department and academic dean to have this period extended; if approved, this extension may involve additional compensating academic requirements.

7. Payment of all financial obligations to the university.

Graduation with Honors or High Honors

The award of “Honors" or ``High Honors" is made at each commencement to a graduating senior who has:

1. Taken a minimum of 60 graded semester hours required for a particular degree at IIT.

2. No record of disciplinary action.

A student who has a grade point average of 3.5 or higher for work completed at IIT will graduate with ``High Honors;" a student who graduates with a grade point average of at least 3.0 but less than 3.5 will graduate with ``Honors."

Illness or Emergency

In case of illness or hospitalization that will require a student to be absent for more than two days of classes, the Office of the Dean of Students (312-567-3080) should be notified at the earliest possible date.

In case of an emergency on campus, students should contact the Campus Police Department at (312) 808-6363.

Placement Testing

Prior to first enrollment, all freshmen and transfer students are required to take the English placement test administered by the Office of Admission. Entering freshmen and transfer students who have not completed a course in calculus also are required to take the mathematics placement test. Depending on the intended major, other tests may also be required. For students entering in the fall semester, placement tests are scheduled in the summer preceding matriculation and must

be completed prior to matriculation. In the case of students entering in January, special arrangements will be made by the Office of Admission with the individual candidate.

Residence Requirements,
Once enrolled at IIT, an undergraduate degree-seeking student is not permitted to enroll at another institution. Such action is considered concurrent enrollment, and no transfer credit will be granted for such enrollment unless the student submits a formal petition in the Office of Educational Services and receives approval from the Academic Standing Committee prior to registration for the courses.

A course may not be taken at another institution in the Chicago metropolitan area if an equivalent course is available at IIT. A course failed at IIT must be repeated at IIT. After the completion of the sophomore year, only upper-division courses at a four-year college or university will be considered for transfer credit.

The final 45 hours of work must be completed in residence at IIT. Any proficiency tests or concurrent enrollment at another institution must be completed before this period.

Second Bachelor's Degree
A student whose first degree was granted by IIT must complete a minimum of 30 additional credit hours at IIT. A student whose first degree was awarded by another institution must complete a minimum of 45 additional credit hours at IIT.

All other graduation requirements apply for the second degree.

Standards of Conduct
IIT believes that acquiring self-discipline is part of the educational process. As in any society, students are responsible for their own conducts. They are therefore responsible for any damage they may do to university property and should maintain satisfactory standards of conduct on and off campus.

Complaints of student misconduct are handled by the Office of the Dean of Students, the Committee on Discipline, or, in case of less serious incidents concerning residence hall or fraternity regulations, by the Residence Hall Association or the Greek Council.

Students are expected to inform themselves of all university regulations and requirements that are published in the Student Handbook.

Withdrawal from the University

Student Rights and Privileges
Students are expected to be thoroughly familiar with the university's provisions for maintaining privacy of educational records; the means by which students may obtain access to their own educational records; and the procedures for petitioning redress of grievances. These statements are published in the Student Handbook.

Transcripts
Transcripts can be requested from the Office of Student Records and Registration, Room 104, Main Building. Requests must bear the signature of the student to comply with the Family Educational Rights and Privacy Act of 1974 as amended. Requests for transcripts should be made at least 10 days prior to the date the transcript is needed and should include the student's Social Security or I.D. Number, dates of attendance, and address where the transcript should be sent. During registration week, please allow additional time for processing transcripts. Transcripts will be released only after the student has fulfilled all financial obligations to the university. Official copies of transcripts are not issued directly to students. A fee of $3.00 is charged for each transcript issued.

Withdrawal from the University
A full-time degree-seeking student intending to withdraw from the university must file a withdrawal form in the Office of Educational Services, Room 101, Main Building. Failure to file a withdrawal

form may create difficulties in the student's eligibility to receive tuition credit, if any is appropriate, in clearing his or her financial record, and in having academic records reflect a withdrawal.

UNDERGRADUATE PROGRAMS AND COURSES

In Course Descriptions, numbers in parentheses indicated (lecture hours-laboratory hours-credit hours).

ARCHITECTURE

Acting Dean: Mr. John F. Hartray S.R. Crown Hall Extension 73230
Assistant Dean: Dirk DenisonS.R. Crown Hall Extension 73262
Director of Undergraduate Programs: Dr. Kevin Harrington S.R. Crown Hall Extension 73260
Professors: Elnimeiri, Summers
Research Professor: Goldsmith
Visiting Institute Professor: Caldwell
Adjunct Professors: Bihler, Hartray, Krawczyk, Sobel
Associate Professors: Chang, Harrington (Joint Appointment with Lewis College), Hovey, Roesch, Schipporeit, Sharpe, Swenson, Takeuchi, Utsunomiya
Studio Professors: Blender, T. Brown, Denison, Eggen, Karidis, Lambke, Lasko, Roszak, Sherefkin, Wetzel
Tutorial Professors: Gadelha, Hovey, Krueck, Nicholson, Olsen, Takeuchi
Faculty Emeriti: G.E. Danforth, Hannaford
Instructors: Cap, Cole, Hamill
Visiting Graduate Professors: Dine, Jahn, Kerbis, Manny

IIT's College of Architecture has a finer environment for students than any architectural school in the country. Chicago is the most important city in the world for the study of contemporary architecture. S.R. Crown Hall, the home of the College, is one of the most significant buildings of the 20th century and was designed by Mies van der Rohe, for 20 years the chairman of IIT's Department of Architecture.

IIT's undergraduate program offers a five-year Bachelor of Architecture degree. Its immediate goal is to develop the architect's craft, teaching the specialized background and technical skills required for practice. But an architect also must have a thirst for knowledge, a knowledge that provides the wisdom required to develop architecture for our time. The challenge is to teach the technical skills while fostering the student's power to think and open his or her mind and imagination to new ideas and solutions.

To meet this challenge, IIT's College of Architecture has developed a new form for the traditional studio called the ``tutorial unit.'' Like an architect's office, the tutorial unit is the home for the student's work. Here, all of the required knowledge must converge, be synthesized, and used effectively.

During their first year, students are trained in a foundation program that prepares them for the many choices offered in the tutorial units during the second through fifth years. Each unit is a four-year cycle headed by a master professor and two full-time faculty members, allowing interaction on related projects between students of different ages and levels of ability under a continuity of instruction. Consulting professors with specific expertise come into the studios.

Architecture
Students pursue their own studies, but also work together in small groups. In each cycle, the entire class will 1) spend one semester studying abroad; 2) design and build a house near campus; and 3) assist the tutorial professor in preparing a book about their unit's experience. This method of teaching will result in students who are able to think and act independently as well as cooperate and contribute within a group.

Architecture--Architecture Option

Required Core Major Courses	**Credit Hours**
ARCH 100, 109, 110, 113, 114, 117, 201, 202, 205, 217, 218, 305, 306, 307, 308, 309, 310, 313, 314, 319, 320, 417, 418, 419, 420, 423, 424	87
City and Regional Planning Requirements	
CRP 203, 204, 307, 308	16
Institute of Design Requirements	
ID 203	1
Mathematics Requirements	

MATH 121, 122	6
Physics Requirements	
PHYS 211, 212	6
Computer Science Requirements	
CS 103	2
Civil Engineering Requirements	
CE 185, 285, 350, 351, 352 (CE 425 is optional)	15
Art & Architectural History Requirements	
AH 219, 220 (AAH 494 is optional)	7
Humanities and Social Science Requirements	
ENGL 101, 100-level HUM	6
Humanities Electives (300-level and above)	6
Social Science Electives (6 hrs. 300-level)	9
Electives	
MGT 351 (Recommended but not required)	3
Elective or Specialized Minor	6
Total Credit Hours	170

Curriculum

First Semester	**Lect.**	**Lab.**	**Cred.**
ARCH 100	1	0	1
ARCH 113	1	10	6
ARCH 109***	0	4	2
MATH 121	3	0	3
CS 103	2	1	2
ARCH 117	0	2	1
ENGL 101*	3	0	3
Totals	10	17	18
Second			
ID 203	1	0	1
ARCH 114	1	10	6
ARCH 110***	0	4	2
MATH 122	3	0	3
CE 185**	3	0	3
HUM 100-level course *	3	0	3
Totals	11	14	18
Third			
ARCH 201	0	10	5
ARCH 217	0	4	2
AAH 219	2	0	2
CE 285**	3	0	3
PHYS 211	3	0	3
ARCH 205	2	2	3
Totals	10	16	18
Fourth			
ARCH 202	0	10	5
ARCH 218	0	4	2
AAH 220	2	0	2
CE 350	3	0	3
PHYS 212	3	0	3
Social Sciences Electives*	3	0	3
Totals	11	14	18

Fifth Semester			
ARCH 305	0	10	5
ARCH 307	0	2	1
ARCH 319	2	0	2
ARCH 309	1	2	2
CRP 203	0	8	4
CE 351	3	0	3
Totals	6	22	17
Sixth Semester			
ARCH 306	0	10	5
ARCH 308	0	2	1
ARCH 320	2	0	2
ARCH 310	1	2	2
CRP 204	0	8	4
CE 352	3	0	3
Totals	6	22	17
Seventh Semester			
ARCH 417	0	12	6
ARCH 423	2	0	2
CRP 307	0	8	4
Humanities Elective*	3	0	3
Totals	5	20	15
Eighth Semester			
ARCH 418	0	12	6
ARCH 424	2	0	2
CRP 308	0	8	4
Social Sciences Elective*	3	0	3
Totals	5	20	15
Ninth Semester (Architecture Option)			
ARCH 313	1	0	2
ARCH 419	0	12	6
CE 425 or			
AAH 494	3	0	3
Elective or Specialized Minor	3 0 3		
Social Sciences Elective*	3 0 3		
Totals	10 12 17		
Tenth Semester (Architecture Option)			
ARCH 314	1	0	2
ARCH 420	0	12	6
MGT 351*	3	0	3
Elective or Specialized Minor	3	0	3
Humanities Elective*	3	0	3
Totals	10	12	17
Total credit hours			170
Ninth Semester (Planning Option)			
CRP 465	3	0	3
CRP 407	2	0	2
CRP 417	3	9	6

Humanities Elective *	3	0	3
Social Sciences Elective *	3	0	3
Totals	14	9	17
Tenth Semester (Planning Option)			
CRP 466	3	0	3
CRP 408	2	0	2
CRP 418	3	9	6
Elective or Specialized Minor	3	0	3
Social Sciences Elective*	3	0	3
Totals	14	9	17
Total credit hours			170

ROTC students may substitute air force aerospace studies, military science (army), and naval science courses for free electives.

* Humanities and social sciences components of General Education Program (see page 19 for details).

** CE 185 and 285 are prerequisites for the civil engineering sequence of courses.

*** Students transferring from the Institute of Design to the Department of Architecture may substitute ID 107 and 108 for ARCH 109 and 110.

Optional Programs

Minors
Architecture students are encouraged to select electives that will provide a sequence of 15 credit hours of learning experiences related to a specific interest that will reinforce the curriculum. These minor fields of study should be chosen early in the student's program in consultation with a departmental adviser.

Planning
Students electing a greater concentration in planning may pursue the fifth-year planning option, which also fulfills the state registration requirements for a degree in architecture.

Bachelor of Architecture/M.B.A. Double Degree Option
Qualified students may earn both the Bachelor of Architecture and Master of Business Administration degrees in six rather than the normal seven years. Students who are completing their eighth semester, or an equivalent of 124 credit hours in architecture at IIT, may apply for entry into the joint program. They should take preparatory courses for the M.B.A. prior to entry and the Graduate Management Admission Test during the eighth semester. Students who anticipate entering into the program should seek counseling in the Stuart School of Business and the Department of Architecture early in their studies at IIT.

COURSES

ARCH 100,Introduction to Architecture
The fundamental objectives and philosophy underlining the architectural curriculum at IIT; the role of the architect as a professional related to the heritage of Chicago architecture; orientation to the local cultural, institutional, and architectural resources. (1-0-1)

ARCH 109:, 110,Freehand Drawing I:, II

Drawing from still life, human figure, and architecture, both out-of-doors and in the studio; drawing from life in various mediums. ARCH 109 is prerequisite for ARCH 110. (0-4-2), (0-4-2)

ARCH 113:, 114,Architecture Studio I:, II
Studio exercises to develop excellence in craftsmanship and visual sensitivity as a foundation for a basic architectural language. Problems of various lengths will deal with the technical skills of drawing and model making materials and in both two and three dimensions. Using problems of both an abstract and an architectural character, this course will build verbal communication skills and model shop ability. ARCH 113 is prerequisite for ARCH 114. (1-10-6) (1-10-6)

ARCH 117,Computers in Architecture
Introduction to architecture software of the PC. Typically will include word processing, spreadsheets, graphics, data communications and database software. (Same as CS 113.) (2-0-1)

ARCH 201:, 202,Architecture III:, IV
The development of architectural principles through the study and analysis of building materials and their application in elemental building types in brick, stone, and wood. Development of the graphic language in architecture. Consideration of the appropriate use of materials, energy, and clear construction as the basis of architecture. Prerequisites: ARCH 101, 102. ARCH 201 is prerequisite for 202. (0-10-5); (0-10-5)

ARCH 205,Computer-Aided Design in Architecture
Introduction to graphic and nongraphic computer applications in architectural and engineering design. Review of basic computer concepts and methods required for application development. Computer programs are written in a variety of design applications. Prerequisite: CS 103 or knowledge of Fortran programming. (2-2-3)

ARCH 217:, 218,Visual Training I:, II
Aesthetic expression as experienced in the study of form, proportion and rhythm, texture and color, mass and space. Exercises in visual perception and aesthetic judgment. Isolation and analysis; interdependence and integration of sensuous qualities. Aesthetic unity under restrictive conditions. Prerequisites: ARCH 101, 102. ARCH 217 is prerequisite for 218. (0-4-2); (0-4-2)

ARCH 305:, 306,Architecture V:, VI
Continued development of architectural principles of Architecture III and IV
through the study of industrial building materials such as steel and concrete and their use in structural systems for buildings of varying magnitudes. Consideration of the interrelation of building structure, enclosure systems, energy consumption, and environmental control systems. Prerequisites: ARCH 201, 202. ARCH 305 is prerequisite for 306. (0-10-5); (0-10-5)

ARCH 307:, 308,Visual Training III:, IV
Continuation of ARCH 218. Prerequisites: ARCH 217, 218. ARCH 307 is prerequisite for 308. (0-2-1); (0-2-1)

ARCH 309:, 310,Mechanical and Electrical Building Systems for Architects I:, II
Selection and design of building support systems: heating, ventilating, air conditioning, water supply, sanitary and storm drainage, power distribution, lighting, communications, and vertical transportation. Systems are analyzed for their effect on building form, construction cost, and operating efficiency. ARCH 309 is prerequisite for 310. (1-2-2); (1-2-2)

ARCH 313:, 314,Architectural Practice I:, II
Lectures and practical problems dealing with specifications, specification writing, administration of construction, contracts, building law, and professional practice. ARCH 313 is prerequisite for 314. (2-0-2); (2-0-2)

ARCH 319,History of Modern Architecture
ARCH 320,History of Chicago Architecture

These courses will offer specialized and advanced studies in the history and critical interpretation of architecture in the modern era. ARCH 319 is prerequisite for 320. (2-0-2); (2-0-2) Architecture.

ARCH 400,Graphic Techniques and Introduction to Architectural Design
This course teaches the development of drawing techniques in various media, both freehand and with instruments in pencil and ink, as a basic architectural language. These techniques will be used as a means of studying and communicating problems of visual perception and aesthetic judgment. The intensive eight week format will allow for exercises of various lengths dealing with the abstract and architectural, including studies of form, proportion, rhythm, texture, and color. These will include studies in three dimensions, providing training in the use of the model shop. Studio, seminar, and lecture sessions will address concepts o architecture, both contemporary and historical. The vast architectural and cultural resources of the architectural capital of the world, Chicago, will be introduced through field trips and tours. (0-16-8) Offered only during the summer session.

ARCH 410:, 412,Analysis of Building Types I:, II
Analysis of significant building types of past epochs and the present and their interrelation with technology and ideas that shaped the architecture of their time. ARCH 410,is prerequisite for 412. (3-0-3); (3-0-3)

ARCH 415,Architecture and Civilization
A study of the history of architecture, as an expression of the development of civilizations, from the Egyptian, Greek, Early Christian, Gothic. The significance of modern architecture is related as a parallel to developments in the past. The emphasis is on architecture as idea and symbol in the nature of man. This is a study of architecture as humanity. (3-0-3)

ARCH 417:, 418,Architecture VII:, VIII
Structure as an architectural factor; space as an architectural problem; proportion as a means of architectural expression; the expressive value of materials; painting and sculpture in their relationship to architecture. Application of principles in a comprehensive project involving program, site, and code analysis. Prerequisites: ARCH 305, 306, CRP 203, 204. ARCH 417 is prerequisite for 418. (0-12-6); (0-12-6)

ARCH 419:, 420,Architecture IX:, X
This studio represents a synthesis of the entire curriculum and the experience of simulating the total design process. A major building or group of related buildings is planned for the specific site. The ability to make value judgments is tested with the complete interrelationship of architectural considerations. Prerequisites: ARCH 417, 418, CRP 308. ARCH 419 is prerequisite for 420. (0-12-6); (0-12-6)

ARCH 421:, 422,Energy Conscious
Design I:, II
Development of building energy budgets. Application of energy conservation methods and renewable energy sources such as wind power and passive solar systems to a variety of building types. ARCH 421 is prerequisite for 422. (3-0-3); (3-0-3)

ARCH 423,Architectural Programming
Study of the principles of problem definition and problem solving related to the decision-making process of design. Skills of collecting, reviewing, and presenting quantities of information are reviewed along with the potential of computer-aided methods and techniques. Applications include identifying a client's needs, considering constraints, and developing a building program by resolving the problem requirements for the ARCH VIII second-semester project. (2-0-2)

ARCH 424,Architectural Construction Management
A survey of the techniques and procedures of construction management as it relates to architectural practice. The organization of the building team, the collaborative design process, cost control, project scheduling, purchasing, accounting, and field supervision are described and documented. (2-0-2)

ARCH 425,Computer-Aided Design inPractice

Review of drafting, modeling, and rendering computer hardware and software used in the practice of architectural design. Design and management issues are explored with the extensive use of PC CAD systems. Prerequisite: ARCH 205 or graduate standing. (2-1-3)

Graduate Courses

See the current IIT Bulletin: Graduate Programs.

BIOCHEMISTRY

Coordinators:
Chemistry Department: Dr. Robert Filler124 Wishnick HallExtension 73425

Biology Department: Dr. Dale Webster396 Life SciencesExtension 73491

Biochemistry uses the modern techniques of chemistry to study the chemical basis of living systems. A knowledge of biochemistry is vital to an understanding of genetics, microbiology, physiology, and pharmacology, as well as growing fields such as biotechnology and toxicology. Molecular biology, a subdiscipline of biochemistry, has become one of the most exciting and fruitful areas of modern science. As the field of biochemistry has matured, the overlap between biology and chemistry has increased and biological systems are being better understood in chemical terms. With its ability to deal with molecular complexity, chemistry is playing an increasingly significant role in clarifying the origins of life and the dynamics of biological processes at the molecular level.

A background in biochemistry provides excellent preparation for medical and dental school and graduate study in many areas and leads to rewarding careers in the health professions, university teaching and research, government laboratories, and an increasing number of industries.

The undergraduate student has the opportunity to select the biochemistry options within the following degree programs: the B.S. in chemistry, the B.A. in chemistry, and the B.S. in biology. The expertise of the faculty in both departments and the excellent laboratory facilities provide the student with an attractive and challenging interdisciplinary program. Students also have the opportunity to participate in the laboratory research projects of the faculty.

Biochemistry Specialization
Bachelor of Science in Chemistry Curriculum

First			
CHEM 124	3	4	
MATH 151	4	2	5
ENGL 101*	3	0	3
CS 105	2	1	2
CHEM 113	0	2	1
Totals	12	8	15
Second			
CHEM 114	0	2	1
CHEM 125	3	3	4
MATH 152	4	2	5
PHYS 103	3	0	3
HUM 100-level course*	**3**	**0**	**3**
Totals	13	7	16
Biochemistry			
Third			
CHEM 237	3	4	4
CHEM 247	2	4	3
MATH 251	4	0	4
PHYS 104	3	3	4
Social Sciences Elective*	3	0	3
Totals	15	11	18
Fourth			
CHEM 239	3	0	3

CHEM 240	1	4	2
CHEM 243	4	0	4
PHYS 203	3	3	4
Humanities/Social Sciences Elective*	3	0	3
Totals	14	7	16

Fifth Semester

CHEM 334	2	0	2
CHEM 335	0	6	2
CHEM 244	3	0	3
BIOL 107	3	0	3
Humanities/Social Sciences*	6	0	6
Totals	14	6	16

Sixth Semester

CHEM 321	2	6	4
BIOL 403	4	0	4
BIOL 404	0	6	3
CHEM 345	4	0	4
CHEM 347	0	4	1
Totals	10	16	16

Seventh Semester

CHEM 415	3	0	3
CHEM 455	3	0	3
Humanities/Social Sciences*	3	0	3
Free Elective	3	0	3
BIOL 214	3	0	3
CHEM 416	1	7	3
Totals 16 7 18			

Eighth Semester

CHEM 538	3	0	3
CHEM 450	0	8	2
CHEM 451	2	0	2
Humanities/Social Science*	3	0	3
BIOL 421	3	3	4
Free Elective	3	0	3
Totals	14	11	17
Total credit hours			132

* Humanities and social sciences components of the General Education Program (see page 19 for details).

Biochemistry Specialization

Bachelor of Arts with Concentration in Chemistry Curriculum

First

CHEM 124	3	3	4
MATH 151	4	2	5
ENGL 101*	3	0	3
CS 105	2	1	2
CHEM 113	0	2	1
Totals	12	8	15

Second			
CHEM 114	0	2	1
CHEM 125	3	3	4
MATH 152	4	2	5
PHYS 103	3	0	3
HUM 100-level course*	3	0	3
Totals	13	7	16
Third Semester			
CHEM 237	3	4	4
CHEM 247	2	4	3
MATH 251	4	0	4
PHYS 104	3	3	4
Social Sciences Elective*	3	0	3
Totals	15	11	18
Fourth Semester			
CHEM 239	3	0	3
CHEM 240	1	4	2
CHEM 243	4 0 4		
PHYS 203	3 3 4		
Humanities/Social Sciences Elective*	3 0 3		
Totals	14 7 16		
Fifth			
CHEM 24	4	0	3
BIOL 107	0	3	
Humanities/Social Sciences Electives*	6	0	6
Free Elective**	3	0	3
Totals	15	0	15
Sixth			
CHEM 321	2	6	4
BIOL 403	4	0	4
BIOL 404	0	6	3
CHEM 345	4	0	4
Humanities/Social Sciences Elective*	3	0	3
Totals	13	12	18
Seventh Semester			
CHEM 415	3	0	3
BIOL 214	3	0	3
Free Electives**	6	0	6
Humanities/Social Sciences Electives*	6	0	6
Totals	18	0	18
Eighth Semester			
CHEM 538	3	0	3
CHEM 450	0	8	2
CHEM 451	2	0	2
BIOL 421	3	3	4
Humanities/Social Sciences Elective*	3	0	3

STX 4113 0 3			
Totals	14	11	17
Total credit hours			133

* Humanities and social sciences components of the General Education Program (see page 19 for details).

**Possible free electives include CHEM 334, 335, 423, 435, and 455.
Biochemistry Specialization
Bachelor of Science in Biology Curriculum

First			
BIOL 107	3	0	3
BIOL 109	1	4	3
CHEM 124	3	3	4
ENGL 101*	3	0	3
Social Sciences Elective *	3	0	3
CHEM 113	0	2	1
Totals	13	9	17
Second			
BIOL 115	3	0	3
BIOL 116	1	4	3
CHEM 114	0	2	1
CHEM 125	3	3	4
HUM 100-level course*	**3 0 3**		
Social Sciences Elective*	3	0	3
Totals	13	9	17
Third Semester			
BIOL 214	3	0	3
CHEM 237	3	4	4
CS 105	2	1	2
MATH 151	4	2	5
Humanities or Social Sciences Elective*	3	0	3
Totals	15	7	17
Fourth Semester			
421	3	3	4
BIOL 495	1	0	1
CHEM 239	3	0	3
MATH 152	4	2	5
PHYS 103	3	0	3
Totals	14	5	16
Biochemistry			
Fifth			
BIOL 401	3	0	3
BIOL 402	0	4	2
MATH 251	4	0	4
PHYS 104	3	3	4
Foreign Language***	3	0	3
Totals	13	7	16
Sixth			
BIOL 403	4	0	4
BIOL 404	0	6	3

PHYS 203	3	3	4
Humanities or Social Sciences Elective*	3	0	
Foreign Language***	3	0	3
Totals	13	9	17

Seventh Semester

CHEM 243	4	0	4
Biology or Chemistry Electives**			6
BIOL 495	1	0	1
Humanities or Social Sciences Elective*	3	0	3
Free Elective	3	0	3
Totals	11	+ 0+	17

Eighth Semester

CHEM 538	3	0	3
CHEM 247	2	4	3
CHEM 244	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Free Elective	3	0	
Totals	14	4	15
Total credit hours		1	32

* Humanities and social sciences components of the General Education Program (see page 19 for details).
** BIOL 515 or 513 are highly recommended.
***Highly recommended, but not required.

BIOLOGY

Chairman: Dr. Robert M. Roth206 Life Sciences Extension 73480
Professors: Lechowich, Roth, Webster
Research Professor: Hoskin
Associate Professors: Cork, Erwin, Jasper, B. Stark
Adjunct Associate Professors: Gendel, Kilbane, McCormick, Rubenstein
Adjunct Assistant Professors: Keller, Kelley, Tortorello
Premedical Adviser: Roth
Undergraduate Adviser: B. Stark
Faculty Emeriti: Bretz, W. F. Danforth, Grecz, Hayashi, Koblick, Roush

The opportunities in biology, biotechnology, biochemistry, microbiology, molecular biology, environmental sciences, and the biomedical professions are more varied and exciting than ever before. Versatile, creative biologists who can work with professionals in other disciplines and apply their knowledge to today's constantly changing problems are in demand, and there is an increasing demand for biologists with skills in computer science, mathematics and statistics, engineering sciences and instrumentation, environmental engineering, and business management. The resources of IIT are particularly suited to such interdisciplinary programs.

The Biology Department offers various degree programs to prepare biologists for leadership in these new directions, these include: a B.S. in biology; a B.S. in biology with professional specialization in biotechnology; a B.S. in biology with professional specialization in biochemistry; a B.S. in biology with professional specialization in microbiology; and a B.A. in biology. The department also advises students interested in the health professions such as medicine, osteopathic medicine, and dentistry, regardless of their majors.

The basic biology curriculum includes in-depth studies of microbiology, genetics, cell biology, molecular biology, and biochemistry. IIT gives biology majors a strong background in chemistry, physics, and mathematics. In their junior and senior years, students may concentrate in one or more areas of specialization and develop interdisciplinary breadth. They also are encouraged to participate in research projects with the faculty.

A biology degree from IIT provides excellent preparation for a wide variety of careers, including medicine, dentistry, pharmacology, biotechnology, biochemistry, biomedical, biochemical, and environmental engineering, medical, and environmental law. Graduates are prepared for immediate entry into positions in industrial and medical research laboratories and for advanced study in areas including microbiology, cell biology, biochemistry, biotechnology,

Biology
genetics, environmental engineering, and molecular biology. In consultation with faculty advisers, students can create concentrations that provide additional training in special areas.

Bachelor of Science in Biology
Students must carefully prepare an approved program of study with their advisers before the end of their junior years.

Biology--B.S.

Required Core	Credit
Major Courses	Hours
BIOL 107, 109, 113, 114, 115, 116, 214, 315, 403, 404, 410, 425, 430 (recommended), 445, 446, 495 (taken more than once)	42
BIOL Electives	12

Mathematics Requirements

MATH 151, 152, 251	14
Physics Requirements	
PHYS 211, 212	6
Chemistry Requirements	
CHEM 124, 125, 237, 239, 247	18

Computer Science Requirements
CS 105 2

Foreign Language Requirement	6
Humanities and Social Sciences Requirements	
ENGL 101, 100-level HUM	6
Humanities Electives (300-level and above)	6
Social Science Electives (6 hrs. 300-level)	12

Electives

Free Electives	6
Total Credit Hours	**130**

Curriculum
Bachelor of Science in Biology

First

BIOL 107	3	0	3
BIOL 109	1	4	3
BIOL 113	0	2	1
CHEM 124	3	3	4
ENGL 101*	3	0	3
Social Sciences Elective*	3	0	3
Totals	13	9	17

Second

BIOL 114	0	2	1
BIOL 115	3	0	3
BIOL 116	1	4	3
CHEM 125	3	3	4
Humanities Elective (100 level)*	3	0	3
Social Sciences Elective*	3	0	3
Totals	13	9	17

Third

BIOL 214	3	0	3
CHEM 237	3	4	4
CS 105	1	2	2
MATH 151**	4	2	5
PHYS 211	3	0	3
Totals	14	8	17

Fourth

BIOL 410	3	0	3
BIOL 425	0	4	2
CHEM 239	3	0	3
MATH 152	4	2	5
PHYS 212	3	0	3
Totals	13	6	16

Fifth Semester

BIOL 315	1	4	3
BIOL 430***	3	0	3
MATH 251	4	0	4
Humanities or Social Sciences Elective*	3	0	3
Foreign Language	3	0	3
Totals	14	4	16

Sixth Semester			
BIOL 403	4	0	4
BIOL 404	0	6	3
BIOL 495	1	0	1
BIOL elective	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Foreign Language	3	0	3
Totals	14	6	17
Seventh Semester			
BIOL 445	3	0	3
BIOL 446	0	4	2
BIOL 495	1	0	1
Biology Elective	3	0	3
or			
CHEM 243***	4	0	4
CHEM	2	4	3
Humanities or Social Sciences Elective*	3	0	3
Totals	12-13	8	15-16
Eighth Semester			
Biology Electives	6	0	6
Humanities or Social Sciences Elective*	3	0	3
Free Electives	6	0	6
or			
CHEM 244* **	**3**	**0**	**3**
Totals	15	0	15
Total credit hours			130-131

* Humanities and social sciences components of the General Education Program (see page 19 for details).

** Depending on their level of preparation, students may be placed in alternative mathematics sequences.

*** Highly recommended, but not required.

Bachelor of Arts in Biology

A Bachelor of Arts degree in biology affords students the opportunity to structure a program to their individual interests while still fulfilling requirements for entry into medical and dental schools and most graduate degree programs. While the Bachelor of Science degree is a structured program in keeping with traditional research and professional requirements in the biological sciences, the Bachelor of Arts degree can be tailored to special interests in broader biology-related fields. This greater freedom requires students to work in close consultation with a departmental adviser to formulate a coherent program of study.

Biology--B.A.

Required CoreCredit
Major CoursesHours

BIOL 107, 109, 113, 114, 115, 116, 214, 315, 403, 404, 410, 425, 430 (recommended), 445, 446, 495 (taken more than once) 43

BIOL Electives 6

Senior Project	3
Mathematics Requirements MATH 121, 122	6
Physics Requirements PHYS 211, 212	6
Chemistry Requirements CHEM 124, 125, 237, 239	15
Computer Science Requirements CS 105	2
Foreign Language Requirement	6
Humanities and Social Sciences Requirements	
ENGL 101, 100-level HUM	6
Humanities Electives (300-level and above) and Social Science Electives (6 hrs. 300-level+)	27

Electives

Free Electives	9
Total Credit Hours	129

Curriculum

Bachelor of Arts with Concentration in Biology

First

BIOL	107	3	0	3
BIOL	109	1	4	3
BIOL	113	0	2	1
CHEM	124	3	3	4
ENGL	101*	3	0	3
Social Sciences Elective*	3	0	3	
Totals	13	9	17	

Second

BIOL 114	0	2	1
BIOL 115	3	0	3
BIOL 116	1	4	3
CHEM 125	3	3	4
HUM 100-level course*	**3**	**0**	**3**
Social Sciences Elective*	3	0	3
Totals	13	9	17

Third Semester

BIOL 214	3	0	3
BIOL 495	1	0	1
CHEM 237	3	4	4
CS 105	1	2	2
MATH 121**	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	14	6	16

Fourth Semester

BIOL 410	3	0	3
BIOL 425	0	2	
CHEM 239	3	0	3
MATH 122	3	0	3
Humanities or Social Sciences Electives*	6	0	6
Totals	15	4	17

Fifth Semester

BIOL 315	1	4	3

BIOL 430***	3	0	3
BIOL 495	1	0	1
PHYS 211	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Foreign Language	3	0	3
Totals	14	4	1 6

Sixth Semester

BIOL 403	4	0	4
BIOL 404	0	6	3
PHYS 212	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Foreign Language	3	0	3
Totals	13	6	16

Seventh

BIOL 445	3	0	3
BIOL 446	0	4	2
BIOL 495	1	0	1
Senior Project 3	0	3	
Humanities or Social Sciences Elective*	3	0	3
Free Elective****	3	0	3
Totals	13	4	15

Eighth

Biology Electives	6	0	6
Humanities or Social Sciences Elective*	3	0	3
Free Electives	6	0	6
Totals	15	0	15
Total credit hours			129

* Humanities and social sciences components of the General Education program (see page 19 for details).

** Depending on their level of preparation, students may be placed in alternative mathematics sequences.
*** Highly recommended but not required.
**** **CHEM 247 is** recommended for premed students or those considering graduate school in the bio-medical sciences or positions in research.

Optional Programs
Bachelor of Science with a Professional Specialization in Microbiology
The department offers a specialization in microbiology which meets the requirements of the American Society of Microbiologists recommended minimal curriculum in microbiology for a microbiologist.

Students must complete a minimum of 140 credits, including BIOL 107, 109, 113, 114, 115, 116, 214, 403, 404, 410, 425, 445, 446, 521, 523, 527, 540, 560, 561, and 595, plus nine credits from the following: BIOL 503, 529, 550, and 571, FST 401, 402, and 403. In the support sciences, students must complete CHEM 124, 125, 237, 239, and 247; MATH 151, 152, and 252; PHYS 211 and 212. Students also must complete two semesters of a foreign language (or establish equivalent proficiency), and all the general education requirements for a Bachelor of Science degree. Students must carefully prepare an approved Program of Study with their advisers before the end of their junior years.

Bachelor of Science with Professional Specialization in Biotechnology
The professional specialization in biotechnology is an innovative curriculum that combines work in biology, chemistry, mathematics, and chemical engineering. This is described in detail on page 81.

Premedical and Predental
A premedical adviser and a premedical advisory committee are available to assist all premedical and predental students. The Bachelor of Science in biology and the Bachelor of Arts in biology satisfy the requirements for entry into medical school. With suitable support courses in biology, physics, math and chemistry, students majoring in other fields are also prepared for medical school. CHEM 247 fulfills the requirements in quantitative analysis for most medical schools and BIOL 107, 109 and BIOL 115, 116 fulfill the requirements in biology for most medical schools. Since entry requirements may vary from one professional school to another, the student should keep in mind the specific requirements of several medical and dental schools while planning a course of study. Students considering the health professions are urged to seek advice in preparing their programs of study. Some students may consider the combined Bachelor of Science and Master of Science in medical physics (see page 221).

Post-Baccalaureate Pre-Medical Program
This program prepares college graduates for application and admission to medical school. In many cases post-baccalaureate students were not pre-meds in college and took few, if any, pre-medical science courses. In other cases post-baccalaureate students have been out of school for awhile and wish to refresh their knowledge, improve their grade point averages, or prepare for the Medical College Admission Test (MCAT). Students in the program have complete access to courses, faculty advising, minority student services, and campus facilities. Post-baccalaureate students are advised by the IIT pre-medical adviser and the Pre-Health Professions Advisory Committee. The program is available for both full-time and part-time enrollment in regular IIT courses. IIT has an excellent record of preparing students for admission and success in medical, dental, and veterinary schools.

Air Force Aerospace Studies, Military Science, and Naval Science

Students in these programs should consult a faculty adviser for appropriate course substitutions in the B.S. or B.A. curriculum.

Minor in Biology
Students who wish to minor in biology should complete BIOL 107 and 109 and four additional courses in biology. Students should consult with an undergraduate adviser for assistance in the selection of these additional courses.

BIOL 107,General Biology Lectures
This course emphasizes biology at the organismal level. It provides an introduction to the study of the structure and function of plants and animals, their origin and evolution, their reproduction and genetics, their diversity and ecological relations. BIOL 107 and 109 plus BIOL 115 and 116 constitutes a one-year sequence in biology. Acceptable as part of the science component of the General Education Program. (3-0-3)

BIOL 109,General Biology Laboratory,
A laboratory course to accompany BIOL 107. Prerequisite: Concurrent or previous enrollment in BIOL 107. (1-4-3)

BIOL 113,Computers in Biology
Introduction to the application of computers in biology. Typically, will include word processing, spreadsheets, graphics, computational biology, data analysis, and special applications. (0-2-1)

BIOL 114,Frontiers in Biology
Readings and discussion of recent developments in biotechnology, genetic engineering, cell biology, computational biology, molecular genetics, ethical issues in science, etc. (0-2-1)

BIOL 115,Human Biology
This course covers selected topics in biology of particular relevance to humans and to human health and disease. Topics include biology of human cells and selected organ systems; neurobiology including psychoactive drugs and drug addiction; development and birth defects; genetics and genetic diseases; toxicology; the immune system and immunology diseases such as AIDS; human nutrition and nutritional effects; microbial human diseases. BIOL 115 plus BIOL 107 (General Biology) constitutes a two-semester sequence in Science. (3-0-3)

BIOL 116,Experimental Biology
A Biology Laboratory course to accompany BIOL 115. A cellular approach to the functional organization of organs and organ systems. Laboratories will include the application of experimental methods and techniques for understanding the relationships between cell function and structure. (1-4-3).

BIOL 214,Genetics and Genetic Technology
An introduction to genetic engineering and genetics designed for both biology and non-science majors. The course will focus on how the study of genetics has been adapted, from contemporary recombinant DNA research to the solution of various practical problems in biotechnology, agriculture, the environment, and the diagnosis and treatment of disease. Basic aspects of transmission, molecular, and population genetics will serve as the background. Prerequisite: One semester of college-level biology, e.g., BIOL 107, 115, or consent of the instructor. (3-0-3)

BIOL 315,Genetics Laboratory
A laboratory course in genetics. Prerequisite: Prior or concurrent enrollment in BIOL 214. (1-4-3)

BIOL 403,General Biochemistry
Molecular organization of cell structures, cell membranes. Protein, nucleic acids, carbohydrates and lipids, their molecular structure, characterization, chemical reactions. Enzymes and enzyme-catalyzed reactions and metabolism. Prerequisite: BIOL 107 or 115 and CHEM 237. (4-0-4)

BIOL 404,Laboratory in Biochemistry
Analytical methods in the chemistry and metabolism of proteins, amino acids, and nucleic acids, including chromatography, spectrophotometry, electrophoresis. Enzyme reactions. Prerequisite: Previous or concurrent enrollment in BIOL 403. (0-6-3)

BIOL 410,Principles of Microbiology
A study of microorganisms and their relation to food, milk, water, soil, sanitation, disease and immunity. Prerequisite BIOL 107 or 115 or equivalent. (3-0-3)

BIOL 414,Genetics for Engineering Scientists,
A course in genetics and genetic engineering designed for advanced students in engineering and related disciplines. The course will cover genetics at the molecular, cellular, organismal, and population levels as a basis for discussions of practical applications of recombinant DNA technology in industry and the fields of medicine, agriculture, etc. A term paper on a topic integrating engineering and biological principles will be required in addition to three examinations. Prerequisite: consent of the instructor. (3-0-3)

BIOL 421,General Microbiology,
A lecture and laboratory course in microbiology. Topics include: anatomy, genetics, biochemistry and physiology of various microorganisms; isolation and identification of microorganisms; microbial growth, design of culture media; microorganisms as biocatalysts and ecological agents. Prerequisites: BIOL 107 or 115 and CHEM 124 (or equivalent) or consent of the instructor. (3-3-4)

BIOL 423,Microbial Genetics Laboratory
Quantitative techniques in microbial genetics including mutagenesis, isolation and characterization of mutants, hybridization, random spore analysis and gene complementation. Basic techniques used in recombinant DNA technology (genetic engineering) will include restriction enzyme analysis and mapping, cloning of DNA fragments into plasmid vectors, transformation of cells with recombinant DNA isolation and analysis of recombinant plasmids and southern blotting. Prerequisites: BIOL 403, 410, and 425. (0-9-3)

Biology

BIOL 425,General Microbiology Laboratory
A laboratory course in microbiology designed for majors in biology, biotechnology, and environmental engineering. Isolation and identification of microorganisms, microbial growth, design of culture media, microorganisms as biocatalysts, environmental microbiology, quantitative microbiology, introduction to microbial genetics and genetic engineering. Prerequisites: BIOL 410 or consent of instructor. (0-4-2)

BIOL 426,Laboratory in Biotechnology
Students undertake individual research projects under faculty supervision. Areas currently available include microbial genetics, biochemistry, genetic engineering, biochemical engineering, fermentation and fermentation control including optimization using computer modeling. A final written report is required. Prerequisite: BIOL 423. (0-12-4)

BIOL 430,Animal Physiology:: Lecture
Respiration; circulation; energy metabolism; temperature regulation; water and osmotic regulation; digestion and excretion; muscle and movement; nerve excitation; information control and integration; chemical messengers. Emphasis on general principles with examples drawn from various animal phyla. Prerequisite: BIOL 107 or 115. (3-0-3)

BIOL 445,Cell Biology
Modern studies of cell structure and function at the cellular, subcellular, and molecular level. Topics include molecular components of cells membranes, membrane bound organelles, microtubular and cytoskeletal components and principles of bioenergetics. Prerequisites: BIOL 107 or 115 and CHEM 237 or consent of the instructor. (3-0-3)

BIOL 446,Cell Biology Laboratory
A laboratory course in cell biology to be taken concurrently with BIOL 445. (0-4-2)

BIOL 458,Principles of Oncology
This course deals with the properties and characteristics associated with the malignant process. Tumor induction by various agents, their detection, diagnosis, and treatment will all be discussed, as will laboratory procedures used in their monitoring and staging. The incidence of cancer within various population groups as well as in several occupational fields will be further examined. Prerequisites: One year of biology and chemistry. (3-0-3)

BIOL 490,Individual Study
Prerequisite: Consent of instructor. (Credit: Variable; maximum 3 credit hours.)

BIOL 491,Biology Research Project
An opportunity for advanced undergraduates to participate in research. A written report covering the procedures, data, and conclusion of the problem is required. Prerequisite: Consent of instructor. Off-campus research projects require the approval of the Biology Undergraduate Research Committee. (Credit: Variable)

BIOL 495,Colloquium
Lectures by prominent scientists. Prerequisites: BIOL 107 and 115, or permission of instructor. This course may not be used to satisfy the natural science general education requirement. -(0-1)

Graduate Courses
The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for full descriptions.

BIOL 503,	Viruses
BIOL 513	Biochemistry
BIOL 514	Toxicology
BIOL 515	Molecular Biology
BIOL 518	Industrial Toxicology
BIOL 519	Biochemistry Laboratory
BIOL 523	Methods in Microbial Physiology and Genetics/Genetic Engineering
BIOL 524	Clinical Toxicology
BIOL 527	Immunology and Immunochemistry
BIOL 529	Applied Immunology
BIOL 531	Cell Physiology
BIOL 533,	Laboratory in Physiology
BIOL 542	Advanced Microbiology Lectures
BIOL 550	Biotechnology
BIOL 560	Microbial Metabolism and Physiology
BIOL 561	Microbial Genetics and Genetic Engineering
BIOL 565	Vertebrate Physiology
BIOL 571	Clinical Microbiology
BIOL 584	Environmental Toxicology and Carcinogenesis
BIOL 589	Teaching in Biology
BIOL 595	Colloquium in Biology

Biotechnology
Director: Dr. Robert Roth 206 Life Sciences Extension 73480

Biology Department:
Dr. Robert Roth 206 Life Sciences Ext. 73480

Chemical Engineering Department:
Dr. Satish Parulekar 144 Perlstein Hall Ext. 73044

Pritzker Department of Environmental Engineering:
Dr. Kenneth E. Noll 103 Alumni Memorial Hall Ext. 73535

Biotechnology is the application of principles from genetics, microbiology, biochemistry, molecular and cell biology, and chemical engineering to the solution of practical problems in industry, medicine, and the environment. For example, genetically engineered bacteria containing human genes are used to manufacture the hormone insulin and the antiviral agent interferon; other types of cells produce monoclonal antibodies, proteins, enzymes, and other important molecules. To be successful, the biotechnologist must, of course, be trained in modern biology, but must also have a solid background in chemistry, mathematics, chemical engineering, and computers. This interdisciplinary training goes beyond the usual curricula offered by traditional university or college departments.

A specialization in biotechnology prepares students for a variety of positions in the new high-tech biotechnology/genetic engineering firms and for jobs in the food, chemical, pharmaceutical, and health care industries. The interdisciplinary nature of the program is also excellent preparation for enrollment in advanced graduate programs or in medical or dental schools.

IIT provides unique opportunities for the study of biotechnology. It is a university of science and technology with strong programs in chemical engineering, the life sciences, computer science, mathematics, chemistry, and physics that provide strong multidisciplinary support for the curriculum in biotechnology. Among the projects currently underway at IIT are modeling, optimization, and computer-control of bioprocesses, research on novel bioreactors, separation processes for bioproducts, and genetic engineering of microorganisms and plants. Small class size allows each student to interact with faculty, to pursue independent studies, and to participate in research. IIT also has an excellent placement office, and graduates are highly successful in gaining admission to graduate and professional schools.

B.S. degree programs with specializations in biotechnology are offered in the departments of biology and chemical engineering. The B.S. in biology with professional specialization in biotechnology will appeal to biology majors, while the B.S. in chemical engineering with professional specialization in biochemical engineering/biotechnology will appeal to chemical engineers. Because the curricula for both programs are similar in the first year, students may defer choice of major department until completion of two academic semesters and a consultation with faculty advisers.

Curricula for the biotechnology specialization in biology and in chemical engineering are presented here. For information about biotechnology courses in environmental engineering, consult the department coordinator.

Biotechnology Specialization
Bachelor of Science in Biology Curriculum

First Semester	Lect.	Lab.	Cred. Hrs.
BIOL 107	3	0	3
BIOL 109	1	4	3
BIOL 113	0	2	1
CHEM 124	3	3	4
MATH 151*	4	2	5
ENGL 101**	3	0	3
Totals	14	11	19
Second Semester			
BIOL 114	0	2	1
BIOL 115	3	0	3
BIOL 116	1	4	3
CHEM 125	3	3	4
MATH 152	4	2	5
PHYS 103	3	0	3
Totals	14	11	19
Third Semester			
BIOL 214	3	0	3
BIOL 495	1	0	1
PHYS 104	3	3	4
HUM 100-level course**	**3**	**0**	**3**
MATH 251	4	0	4
Social Sciences Elective**	3	0	3
Totals	17	3	18
Fourth Semester			
BIOL 410	3	0	3
BIOL 425	0	4	2

CHEM 243	4	0	4
MATH 252	4	0	4
CS 105	2	1	2
Humanities or Social Sciences Elective**	3	0	3
Totals	16	5	18

Fifth Semester

CHEM 237	4	3	4
CHEM 244	3	0	3
CHE 202	2	2	3
PHYS 203	3	3	4
Humanities or Social Sciences Electives**	3	0	3
Totals	15	8	17

Sixth Semester

BIOL 403	4	0	4
BIOL 404	0	6	3
CHEM 239	3	0	3
CHE 301	3	0	3
Humanities or Social Sciences Elective**	3	0	3
Totals	13	6	16

Seventh Semester

BIOL 423	0	9	3
BIOL 550	3	0	3
CHE 303	4	0	4
Humanities or Social Sciences Elective**	3	0	3
Biology Elective	3	0	3
Totals	13	9	16

Eighth Semester

BIOL 426	0	12	4
BIOL 515 or BIOL 561	3	0	3
CHE 422	4	0	4
BIOL 495	1	0	1
Humanities or Social Sciences Elective	3	0	3
Totals	11	12	15
Total credit hours:			138

*Depending on their level of preparation, students may be placed in alternative mathematics sequences.

**Humanities and social sciences components of the General Education Program (see page 19 for details).

Biotechnology Specialization
Bachelor of Science in Chemical Engineering Curriculum

First Semester	Lect.	Lab.	Cred. Hrs.
MATH 151*	4	2	5
CHEM 124	3	3	4
CS 105	2	1	2
ENGL 101**	3	0	3
CHE 111	0	2	1

Social Sciences Elective**	3	0	3
Totals	15	8	18

Second Semester

MATH 152	4	2	5
PHYS 103	3	0	3
CHEM 125	3	3	4
EG105	1	2	2
HUM 100-level course**	3	0	3
CHE 112	0	2	1
Totals	14	9	18

Third Semester

MATH 252	4	0	4
CHE	2	3	
CHEM 243	4	0	4
CHEM 104	3	3	4
CHEM 247	2	4	3
Totals	15	9	18

Fourth Semester

MATH 251	4	0	4
PHYS 203	3	3	4
CHEM 244	3	0	3
CHE 301	3	0	3
MECH 200	3	0	3
Totals	16	3	17

Fifth Semester

BIOL 107	**3**	**0**	**3**
CHE 303	4	0	4
CHE 351	3	0	3
CHEM 237	3	4	4
Humanities Elective**	3	0	3
Totals	16	4	17

Sixth Semester

EE 383	3	0	3
CHEM 239	3	0	3
CHE 317	1	3	2
CHE 439	3	0	3
Humanities Elective**	3	0	3
Social Sciences Elective**	3	0	3
Totals	16	3	17

Seventh Semester

CHE 42	0	4	
CHE 418	1	3	2
CHE 495	1	2	2
CHE 436	3	3	4
BIOL 214	3	0	3
Social Sciences Elective**	3	0	3
Totals	15	8	18

Eighth Semester

CHE 406	3	0	3
CHE 496	2	2	3
CHE 487	3	0	3
BIOL 211	4	0	4

BIOL 403	4	0	4
Totals	16	2	17
Total credit hours			140

*Depending on their level of preparation, students may be placed in alternative mathematics sequences.

**Humanities and social sciences components of the General Education Program (see page 19 for details).

BUSINESS, STUART SCHOOL OF

Dean: Dr. M. Zia Hassan
Director, Undergraduate Business Programs: Mr. Shawn T. Thelen
Administrative Director, Financial Markets and Trading:
Ms. Deborah Whang
Professors: Chung, Goldhar, Hassan, Smith, Thomopoulos
Associate Professors: Bariff, Calero, Ginn, Hall, Knowles, Kraft, Prabhaker (visiting), Tourk
Assistant Professors: Hamilton (visiting), Hawk, Imam (visiting), Makhija (visiting), Twombly
Lecturer: Rausch
Faculty Emeriti: M.A. Cohen, Davis, Spencer

The Stuart School of Business offers the following undergraduate degrees: Bachelor of Science in Accounting, Bachelor of Science in Financial Markets and Trading, Bachelor of Science in Business Administration, and Bachelor of Science in Management Information Systems.

The Stuart School of Business's faculty is committed to providing students with a high quality business education. The faculty has demonstrated their competence by authoring many textbooks and publishing numerous articles. This academic competence is augmented by a variety of practical experiences in business and industry as well as extensive consulting.

The City of Chicago, home of the Stuart School of Business, is an international center for accounting, financial, manufacturing, and service companies. This affords students the opportunity to study in one of the most dynamic business and financial environments in the world. In addition, Stuart School students, can take advantage of the numerous part-time and full-time career opportunities offered by Chicago's thriving accounting, financial, and business communities.

A wide range of challenging opportunities lies ahead of the student planning a career in business. Accounting, financial, manufacturing, service, and government organizations are in need of employees with management skills. Many graduates from business schools continue their education with advanced degrees in law, business, and public administration.

Core Business Program

The core business program has been carefully designed to provide students with a common body of knowledge in business and management. A total of 45 credit hours of core program courses is required of all Accounting and Business Stuart School students.It consists of the following:

Freshman/Sophomore Foundation Courses:

ACCT 130 Accounting Principles I
ACCT 131 Accounting Principles II

ECON 211 Principles of Macroeconomics
ECON 212 Principles of Microeconomics
MGT 221 Business Law I
MSC 221 Basic Probability and Statistics
MSC 315 Management Science

Junior/Senior Functional Field Courses:

FIN 350 Corporate Finance
IS 326 Information Systems

MGT 314 International Business
MGT 351 Theory of Organization and Management

MGT 421 Human Resource Management
MKT 371 Marketing
OM 312 Introduction to Operations Management
Senior Integrative Course

MGT 450 Management Policy
Freshmen and sophomores may not enroll in junior/senior courses. A junior/senior student is defined as one who has earned 62 or more academic credit hours towards his or her degree. The Bachelor of Science in Business Administration and Bachelor of Science in Management Information Systems require a minimum of 57 semester hours of academic credit outside the Stuart School of Business. The Bachelor of Science in Accounting requires a minimum of 51 semester hours of academic credit outside the Stuart School of Business.

Bachelor of Science in Accounting
(B.S. in Acct.)
The Stuart School's Bachelor of Science in Accounting degree is a four-year program. It is designed for students who plan on becoming professional accountants in public accounting, business and industry, or in the public sector. The accounting curriculum provides a solid foundation of theory and practice in the areas of financial accounting, managerial accounting, auditing, and tax accounting. The accounting program is designed to foster an understanding of the accounting profession and its role in modern business. In addition, students receive a broad exposure to basic management and business concepts.

The accounting program is designed to be student-oriented. The emphasis throughout the program is on the development of student communication and interpersonal skills, as well as hands-on computer experience.

The Bachelor of Science in Accounting degree more than fulfills all the academic requirements needed to sit for the Uniform C.P.A. Examination. Students are eligible to take the exam as early as the last semester of their senior year.

The Bachelor of Science degree requires a minimum of 126 semester hours of course work. Included are the following required Accounting courses:

FINANCIAL ACCOUNTING
ACCT 130 Accounting Principles I
ACCT 131 Accounting Principles II
ACCT 330 Intermediate Accounting I
ACCT 331 Intermediate Accounting II
ACCT 430 Advanced Accounting

MANAGERIAL ACCOUNTING
ACCT 332 Cost and Managerial Accounting I
ACCT 432 Cost and Managerial Accounting II

AUDITING
ACCT 435 Auditing Theory I
ACCT 436 Auditing Theory II

TAX ACCOUNTING
ACCT 337 Federal Income Tax I
ACCT 437 Federal Income Tax II

BUSINESS LAW
MGT 221 Business Law I
MGT 222 Business Law II

B.S. IN ACCOUNTING

First Semester	Cred. Lect	Lab	Hrs.
ACCT 130	3	0	3
CS 103	2	1	2
CS 101***	3	0	3
MATH 141**	3	0	3

MSC 115	1	2	1
Natural Science and/or Engineering Elective*	3	0	3
Totals	15	3	15

Second Semester

ACCT 131	3	0	3
HUM 100-level course***	3	0	3
MATH 142** 3	0	3	
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences Elective***	3	0	3
Totals	15	0	15

Third Semester

ECON 211	3	0	3
MGT 221	3	0	3
MSC 221	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences Elective***	3	0	3
Humanities (300 level) Elective***	3	0	3
Totals	18	0	18

Fourth Semester

ECON 212	3	0	3
MGT 222	3	0	3
MSC 315	3	0	3
Humanities (300 level) Elective***	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences (300 level) Elective***	3	0	3
Totals	18	0	18

Fifth Semester

ACCT 330	3	0	3
ACCT 332	3	0	3
FIN 350	3	0	3
IS 326	3	0	3
MKT 371	3	0	3
Totals	15	0	15

Sixth Semester

ACCT 331	3	0	3
ACCT 337	3	0	3
MGT 314	3	0	3
MGT 351	3	0	3
OM 312	3	0	3
Totals	15	0	15

Seventh Semester

ACCT 430	3	0	3
ACCT 437	3	0	3
ACCT 435	3	0	3
MGT 421	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15

Eighth Semester

ACCT 432	3	0	3
ACCT 436	3	0	3
MGT 450	3	0	3
Non-business Elective	3	0	3
Social Sciences (300 level) Elective***	3	0	3
Totals	15	0	15
Total credit hours			126 minimum

*Each student must take a total of 11 credit hours of Natural Science and/or Engineering courses. These courses satisfy the General Education Requirements (see p.19 for details).

** Suitably qualified students may take MATH 151 instead of MATH 141 and 142.

*** Humanities and Social Sciences components of the General Education Requirements (see p.20 for details).

Bachelor of Science in Business Administration (B.S.B.A)

In their junior year, students pursuing the Bachelor of Science in Business Administration degree chose an area of professional specialization. Specializations offered are Finance, Marketing Management, and Operations Management.

Finance

Financial managers are responsible for managing a company's cash flow in order to increase profitability. They are also responsible for the analysis and development of information used to assess a firm's present and future financial status. Practically all firms require one or more financial managers. Financial managers often hold positions as treasurer, comptroller, financial analyst, and credit manager.

Finance Specialization Courses

ACCT 330 Intermediate Accounting I
FIN 452 Investments, Portfolio

Theory and Portfolio Management

FIN 453 Financial Markets and

Institutions

FIN 454 Options and Futures
FIN 456 Seminar in Finance
FIN 475 International Trade and

Finance Marketing Management

Marketing includes the strategic development, design, pricing, advertising, and distribution of products. Marketing graduates often find work in product management, advertising and public relations, market research and analysis, and sales.

Marketing Management Specialization Courses

MKT 471 Marketing Research
MKT 472 Communications and Consumer Marketing
MKT 478 Business Marketing
MKT 481 Product, Pricing and Distribution Management
MKT 483 Sales and Sales Management
MKT 483 International Marketing

Operations Management

Operations Management involves the purchasing, planning, and production of materials into a quality finished goods or service. Operations Management graduates often pursue careers in

manufacturing and service companies as quality managers, production/operations managers, purchasing managers, capacity planners, and materials planners.

Operations Management Specialization Courses
ACCT 332 Cost and Managerial Accounting I
IS 439 Business Information Systems
OM 423 Operations System Design
OM 425 Simulation of Operation Systems
OM 433 Quality Management
OM 442 Materials Management

B.S. in BUSINESS ADMINISTRATION

First Semester	Lect	Lab	Cred. Hrs.
ACCT 130 3	0	3	
CS 103	2	1	2
ENGL 101***	3	0	3
MATH 141**	3	0	3
MSC 115	1	2	1
Natural Science and/or Engineering Elective*	3	0	3
Totals	15	3	15
Second Semester			
ACCT 131	3	0	3
MATH 142**	3	0	3
HUM 100-level course***	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences Elective***	3	0	3
Totals	15	0	15
Third Semester			
ECON 211	3	0	3
MSC 221	3	0	3
MGT 221	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences Elective***	3	0	3
Humanities (300 level) Elective***	3	0	3
Totals	18	0	18
Fourth Semester			
ECON 212	3	0	3
MSC 315	3	0	3
Humanities (300 level) Elective***	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences (300 level) Elective***	6	0	6
Totals	18	0	18
Fifth Semester			
FIN 350	3	0	3
IS 326	3	0	3
MGT 351	3	0	3
MKT 371	3	0	3
OM 312	3	0	3
Totals	15	0	15

Sixth Semester			
MGT 314	3	0	3
SPECIALIZATION COURSE	3	0	3
SPECIALIZATION COURSE	3	0	3
Non-Business Elective	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15
Seventh Semester			
MGT 421	3	0	3
SPECIALIZATION COURSE	3	0	3
SPECIALIZATION COURSE	3	0	3
Non-Business Elective	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15
Eighth Semester			
MGT 450	3	0	3
SPECIALIZATION COURSE	3	0	3
SPECIALIZATION COURSE	3	0	3
Free Elective	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15
Total credit hours			126 minimum

*Each student must take a total of 11 credit hours of Natural Science and/or Engineering courses. These courses satisfy the General Education Requirements (see p.19 for details).

**Suitably qualified students may take MATH 151 instead of MATH 141 and 142.

*** Humanities and Social Sciences components of the General Education Requirements (see p.20 for details).

Bachelor of Science (B.S.) In Financial Markets and Trading (FM&T)

The Bachelor of Science in Financial Markets & Trading (FM&T) will provide students with a thorough understanding of the workings and interrelationships of the various financial markets. Students will explore the nature of all types of financial instruments. They will learn about the kinds of businesses that provide services and products to corporations and investors who are the end-users that depend on the markets to control risk and provide adequate return on investment. The B.S. program will also focus on the practice of trading in today's financial markets, and will include the traditional as well as the new derivative markets. It will examine investment and trading strategies, current research being conducted and the present state of industry technology. The program is intended to prepare students for a career in the financial markets, whether as a corporate risk manager, a floor trader, or a banker that utilizes financial instruments.

Students interested in pursuing the Bachelor of Science in Financial Markets and Trading should confer with the program adviser to schedule their courses.

Bachelor of Science in Management Information Systems (B.S.M.I.S.)

The Bachelor of Science in Management Information Systems (MIS) prepares students to solve business problems and to use information systems to support and improve business functions.

MIS students study both the fundamental and most recent innovations in computer hardware and software development.

Typically, new MIS graduates work either as programmer/analysts within an MIS department's systems development area or as specialists who support the development of information systems by end users.

Management Information Systems Courses
CS 200 Introduction to Computing
CS 325 Data Processing and File Management
CS 425 Database Organization
IS 439 Business Information Systems
IS 440 Systems Analysis, Design, and Implementation
IS 441 Business Data Communication
IS 445 Decision Support and Expert Systems
ENGL 421 Technical Writing

Bachelor of Science in Management Information Systems
Cred.

First Semester	Lect	Lab	Hrs.
ACCT 130	3	0	3
CS 103	2	1	2
ENGL 101***	3	0	3
MATH 141**	3	0	3
MSC 115 1	2	1	
Natural Science and/or Engineering Elective*	3	0	3
Totals	15	3	15
Second Semester			
ACCT 131	3	0	3
MATH 142** 3	0	3	
HUM 100-level course***	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences Elective***	3	0	3
Totals	15	0	15
Third Semester			
ECON 211	3	0	3
MGT 221		0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences Elective***	3	0	3
Humanities (300 level) Elective***	3	0	3
Totals	18	0	18
Fourth Semester			
ECON 212	3	0	3
MSC 315	3	0	3
CS 325	3	0	3
Humanities (300 level)			
Elective***	3	0	3
Natural Science and/or Engineering Elective*	3	0	3
Social Sciences (300 level) Elective***	3	0	3
Totals	18	0	18
Fifth Semester			
FIN 350	3	0	3
IS 326	3	0	3
CS 200	3	0	3

MKT 371	3	0	3
OM 312	3	0	3
Totals	15	0	15

Sixth Semester

CS 425	3	0	3
IS 445	3	0	3
MGT 314	3	0	3
MGT 351	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15

Seventh Semester

IS 440	3	0	3
IS 441	3	0	3
MGT 421	3	0	3
ENGL 421	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15

Eighth Semester

IS 439	3	0	3
MGT 450	3	0	3
Social Sciences (300 level) Elective***	3	0	3
Non-Business Elective	3	0	3
Non-Business Elective	3	0	3
Totals	15	0	15
Total credit hours			126 minimum

* Each student must take a total of 11 credit hours of Natural Science and/or Engineering courses. These courses satisfy the General Education Requirements (see p.19 for details).

** Suitably qualified students may take MATH 151 instead of MATH 141 and 142.

*** Humanities and Social Sciences components of the General Education Requirements (see p.20 for details).

Note: ENGL 421 is part of the B.S. in M.I.S. degree and does not count as a humanities elective. Students are required to complete 12 credits of humanities in addition to ENGL 421.

Double Degree Program: Bachelor/M.B.A.

One of the most appealing career preparations is the combination of any Bachelor's degree with the Master of Business Administration (M.B.A.) degree. IIT students who complete the necessary undergraduate business courses may earn both any Bachelor's degree and the M.B.A. degree in five rather than the usual six years. An exception exists in the case of architecture, where qualified students may earn a Bachelor's degree and the M.B.A. degree in six rather than the usual seven years.

To help the student select undergraduate business courses for which he or she might be awarded advanced standing in the M.B.A. program, the following list indicates the courses that should be taken and their equivalents in advanced standing toward the M.B.A.:

Take as undergraduate:	**Advanced standing in graduate school for:**
ACCT 130, 131	MBA 510
MGT 351	MBA 520
MSC 221	MBA 540
ECON 212	MBA 530
FIN 350	MBA 550
OM 312	MBA 570

MKT 371	MBA 560
MGT 314	MBA 580

Students who are considering the Bachelor/M.B.A. program should consult with the Director of Undergraduate Business Programs of the Stuart School of Business as early as possible in their undergraduate program. This is in order to plan a program enabling them to receive the maximum amount of advanced standing credits toward their M.B.A.

Since employment in many professions often leads to management responsibility, non-business majors should consider taking a minor in management to help develop their competence as managers. A minor in management would also help those students who seek an M.B.A. after conclusion of their undergraduate program.

Formal application to the M.B.A. program should be submitted prior to the completion of the seventh semester of the Bachelor's program.

Double Degree Program:: B.S./J.D.
It is possible for qualified students to satisfy the requirements for the Bachelor of Science in Business Administration and the Juris Doctor in six years. See page for further details.

COURSE DESCRIPTIONS

Courses in the Stuart School of Business are offered in the areas of Accounting (ACCT), Economics (ECON), Finance (FIN), Financial Markets and Trading (FMT), Information Systems (IS), Management (MGT), Management Sciences (MSC), Marketing (MKT), and Operations Management (OM).

Accounting

ACCT 130,Accounting Principles I
Basic concepts and fundamentals of financial accounting are introduced. The accounting equation, accrual accounting, and the preparation of financial statements are explored, as well as specific asset areas. Use of computers in preparation and presentation of financial accounting data is emphasized. (3-0-3) Offered in Fall, Spring, and Summer.

ACCT 131,Accounting Principles II
The companion course and sequel to Accounting 130. Basic financial accounting concepts and fundamentals continue to be explored with an emphasis on partnerships, corporations, and financial statement analysis. An introduction to management accounting concepts is also provided. Prerequisite: ACCT 130. (3-0-3) Offered in Spring and Summer.

ACCT 330,Intermediate Accounting I
This course provides an in-depth understanding of generally accepted accounting principles underlying financial statements. Areas covered include assets, liabilities, and income measurement. Prerequisites: ACCT 131 and Junior standing. (3-0-3) Offered in Fall.

ACCT 331,Intermediate Accounting II
The companion course and sequel to ACCT 330. Coverage of long-term investments, owner's equity, pensions, leases, income taxes treatment, cash flows, and financial statement disclosures and issues are emphasized. Prerequisite: ACCT 330. (3-0-3) Offered in Spring.

ACCT 332,Cost and Managerial Accounting I
Provides an understanding of cost and managerial concepts and fundamentals. Deals with cost accounting techniques (job, process, and standard costing), joint and byproduct costs, cost-volume-profit analysis, and relevant cost analysis for decision-making. Prerequisites: ACCT 131 and Junior standing. (3-0-3) Offered in Fall.

ACCT 337,Federal Income Tax I

The basic concepts of Federal tax laws as they relate to the taxation of individuals. Concepts of gross income, exclusions, deductions, exemptions, and credits are covered, as well as property transactions. Prerequisites: ACCT 330 and Junior standing. (3-0-3) Offered in Spring.

ACCT 430,Advanced Accounting I
Accounting concepts and practices are investigated in the areas of accounting for multi-corporate entities and acquisitions, accounting for not-for-profit organizations, partnership accounting, statement of cash flows, segment reporting, and international accounting. Prerequisite: ACCT 331. (3-0-3) Offered in Fall.

ACCT 432,Cost and Managerial Accounting II
The application of cost and managerial accounting to management decision-making. Topics covered include capital budgeting, transfer pricing, and segment performance evaluation. Students will obtain hands-on computer experience, as well as exposure to mathematical models, decision models, and statistical techniques. Prerequisite: ACCT 332. (3-0-3) Offered in Spring.

ACCT 435,Auditing Theory I
Examination of the process of accumulating and evaluating audit evidence. Areas covered include generally accepted auditing standards, professional ethics, auditors' legal responsibilities, organization of the accounting profession, financial and operational audits, and the impact of U.S. securities laws on auditing. Prerequisite: ACCT 331. (3-0-3) Offered in Fall.

ACCT 436,Auditing Theory II
The companion course and sequel to ACCT 435. This course covers recent professional pronouncements as well as the implementation of generally accepted auditing standards through the integration of sampling techniques and computer software. Practice in solving CPA examination-level problems. Prerequisite: ACCT 435. (3-0-3) Offered in Spring.

ACCT 437,Federal Income Tax II
The companion course and sequel to ACCT 337. Federal tax law as it relates to corporations and partnerships in the areas of formation, operations, and distributions is the main emphasis. Other topics include the Internal Revenue Service, estate and gift taxation, and an introduction to tax-research methods. Prerequisite: ACCT 337. (3-0-3) Offered in Fall.

ACCT 491,Independent Reading and Research
Independent investigation of problems within the area of the student's special interest, to be supervised by a faculty member. Prerequisites: Consent of instructor and junior standing. (Credit: Variable)

Economics

ECON 211,Principles of Macroeconomics
The determination of output, employment, and the rate of inflation. Topics include a broad based discussion of the controversies in macro-economics, the appropriate use of fiscal and monetary policy, the effects of a budget deficit, determination of the rate of exchange, and the trade deficit. (3-0-3) (S) Offered in Fall, Spring, and Summer.

ECON 212,Principles of Microeconomics
Introduction to the theory of markets and the determination of outputs and prices. Topics include demand theory, production theory, a discussion of competition, monopoly and oligopoly and input markets. (3-0-3) Offered in Fall, Spring, and Summer.

ECON 423,Economic Analysis of Capital Investments
The evaluation of proposed capital investments in the public and private sectors. Equivalent worth, rate of return, and benefit/cost methods. Treatment of the time value of money, taxes, inflation,

risk, interrelated investments and capital budgeting. Prerequisite: Junior standing. (3-0-3) (S) Offered in Fall and Spring.

NOTE: STUART SCHOOL OF BUSINESS STUDENTS ARE NOT PERMITTED TO ENROLL IN THIS COURSE.

ECON 491,Independent Reading and Research
Independent investigation of problems within the area of the student's special interest, to be supervised by a faculty member. Prerequisites: Consent of instructor and Junior standing. (Credit: Variable)

Finance

FIN 350,Corporate Finance
A comprehensive study of corporate financial management. The main focus is in capital budgeting, risk and return, financing decision, dividend policy, and capital structure. The role of financial markets and the design of securities will also be covered. Prerequisites: ACCT 131 and Junior standing. (3-0-3) Offered in Fall and Summer.

FIN 452,Investments, Portfolio Theory and Portfolio Management
A comprehensive study of portfolio theory, asset classes and investment instruments, securities analysis and portfolio management techniques. The course will examine, not only the traditional securities markets for stocks and bonds, but also recently developed markets for managing portfolio exposures such as equity options, stock index futures and currency contracts. Prerequisite: FIN 350. (3-0-3) Offered in Fall.

FIN 453,Financial Markets and Institutions
A study of the financial markets, the financial system and the institutions that play important roles in the system such as banks, investment companies, insurance companies, exchanges (for stocks, futures and options) and broker/dealer networks (for stocks, bonds, currencies, swaps and other derivative instruments). The course will also address the applications of finance theory to the analysis of existing financial markets, financial services and institutions. Prerequisites: FIN 452. (3-0-3) Offered in Spring.

FIN 454,Options and Futures
An in-depth study of options and futures contracts. Topics will include: contract design, pricing, arbitrage conditions, trading strategies (such as delta-neutral option spreading and technical systems for trading futures), and the uses of options and futures for hedging price risks and for managing portfolio risks and corporate cash flows. Prerequisite: FIN 350. (3-0-3) Offered in Spring.

FIN 456,Seminar in Finance
An advanced course for financial management. Topics may include advance capital budgeting, financial decision making, security analysis, and mergers and acquisitions. Current development in Financial markets may also be covered. Prerequisites: FIN 453. (3-0-3) Offered in Spring.

FIN 475,International Trade and Finance
Principles underlying exchange of goods and services among nations. Impact of international trade on the domestic economy. Policies relating to tariffs and trade agreements. International financial relationships. International financial markets. Balance of payments adjustments, exchange rate determination and forward exchange markets. Portfolios and direct investment of multinational firms. Prerequisites: ECON 211 and ECON 212. (3-0-3) Offered in Spring.

FIN 491,Independent Reading and Research
Independent investigation of problems within the area of the student's special interest, to be supervised by a faculty member. Prerequisites: Consent of the instructor and Junior standing. (Credit: Variable)

Financial Markets and Trading

FMT 351 The Equity Markets
An overview of the markets for stocks and related instruments such as equity options, warrants, stock index baskets, stock index futures. The course will examine the markets for new issues, the secondary, third and fourth markets, as well as derivative markets; and it will focus on how trading in those markets operates and how the various markets are interrelated. Prerequisites: ACCT 131, ECON 211, MSC 221. (3-0-3)

FMT 352 The Markets For Interest Rate Instruments
An overview of the Treasury bill, note and bond markets, markets for short-end interest rate instruments such as bankers acceptances and federal funds, markets for corporate paper and government agency debt, etc. The course will also survey futures, forward and swap markets in interest rate instruments; and it will include discussion of the major foreign debt markets. Prerequisites: ACCT 131, ECON 211, MSC 221. (3-0-3)

FMT 353 The Foreign Currency Markets
An overview of the markets for trading in foreign currencies, including spot and forward markets, swaps, futures and options. The course will include discussion of what determines relative currency prices and some discussion of the pricing of the various derivative instruments. It will include examination of corporate and institutional trading in and uses of these markets and instruments. Prerequisites: ACCT 131, ECON 211, MSC 221. (3-0-3)

FMT 354 The Commodity Markets
An overview of the spot, forward, futures and swap markets for various kinds of commodities, including metals, oil and other energy products, agricultural products such as grains and meats, and developing areas such as emission allowances. The course will examine the importance of these different markets in the economics of various industries in which they are used, examining topics such as the impact of hedging on pricing decisions and profit margins; and it will examine managed accounts as an investment vehicle. Prerequisites: ACCT 131, ECON 211, MSC 221. (3-0-3)

FMT 356 Investments, Portfolio Theory and Portfolio Management
A comprehensive study of portfolio theory, asset classes and investment instruments, securities analysis and portfolio management techniques. The course will examine, not only the traditional securities markets for stocks and bonds, but also recently developed markets for managing portfolio exposures such as equity options, stock index futures and currency contracts. Prerequisites: FMT 351 or 352, FIN 350, and Junior Standing (3-0-3)

FMT 357 International Trade and Finance
Principles underlying exchange of goods and services among nations. Impact of international trade on the domestic economy. Policies relating to tariffs and trade agreements. International financial relationships. International financial markets. Balance of payments adjustments, exchange rate determination and forward exchange markets. Portfolios and direct investment of multinational firms. Prerequisites: ECON 211, 212, and Junior Standing. (3-0-3)

FMT 458 Financial Market Structure
A study of the financial system and the institutions that play important roles in the system such as banks, investment companies, insurance companies, exchanges (for stocks, futures and options) and broker/dealer networks (for stocks, bonds, currencies, swaps and other derivative instruments). The course will also examine the structure of domestic and international capital markets, markets for derivative products, and the interrelationships among interest rate, currency

and equity instruments, between derivative and cash markets, and other market interrelationships. Prerequisites: FMT 351, 352, 353, 354, and FIN 350. (3-0-3)

FMT 459 Options and Futures
An in-depth study of options and futures contracts. Topics will include: contract design, pricing, arbitrage conditions, trading strategies (such as delta-neutral option spreading and technical systems for trading futures), and the uses of options and futures for hedging price risks and for managing portfolio risks and corporate cash flows. Prerequisites: FMT 351, 352, 353, 354, FIN 350, and Junior Standing. (3-0-3)

FMT 460 Managerial Accounting For Financial Institutions
A study of the accounting issues and theory surrounding financial instruments. The course will cover the issues addressed by FASB's Long-Term Financial Instruments Projects Definition of Financial Investments-FAS 105. Topics will include on-balance-sheet-financial instruments such as notes receivable, mortgages, bonds, certificates of deposit and notes payable and off-balance sheet instruments such as forwards, futures, swaps and options. It will cover the terms for instruments and accounting principles such as recognition and measurements alternatives, mark-to-market, trade date vs. settlement date as well as FAS 52 and FAS 80 treatments for off-balance-sheet instruments. Prerequisites: FMT 351, 352, 353, and 354. (3-0-3)

FMT 461 Legal, Regulatory and Ethical Issues In Financial Markets
In addition to more familiar ethical and legal topics such as fiduciary responsibilities, general suitability of investments and inside information, the course will also treat legal/regulatory topics such as questions of regulatory jurisdiction, ERISA responsibilities, market integrity and attorney-client relations for regulated entities as well as some subjects of current regulatory and legal debate such as front running, dual trading and pick-offs that may or may not deserve regulatory attention in the near future. Other topics include operational issues such as out-trades, what happens if a trade does not clear, what happens if securities are not delivered, etc. Prerequisites: FMT 351, 352, 353, 354 and 458. (3-0-3)

FMT 463 Investment and Trading Strategies
Investment strategies for stocks, bonds, and other traditional investment vehicles; assumptions underlying the various approaches; the trading tactics necessary to implement and manage those strategies; problems that might be expected. Hedging tactics and risk management. Short-term trading strategies for stocks, bonds, currencies, futures, options, and other derivative instruments, and the assumptions underlying each. Software available for some of these approaches. Will involve simulated trading as a critical part of the subject matter and the final grade. Prerequisites: FMT 351, 352, 353, 354, 458 and 459.(3-0-3)

Information Systems

IS 326,Information Systems
Applications of information systems to improve business strategy and performance. Functional capabilities of hardware and software. System development and successful implementation. Case studies and software exercises. Prerequisites: CS 103 or 105 and Junior standing. (3-0-3) Offered in Fall and Summer.

IS 439,Business Information Systems
The design of transaction processing systems for financial and logistical business applications. Both accounting and manufacturing software are used. Prerequisites: ACCT 131, and IS 326. (3-0-3) Offered in Spring.

IS 440,Systems Analysis, Design, and Implementation
Structured and object-oriented systems analysis methods are used to prepare user information requirements and hardware specifications. Computer-assisted software engineering (CASE) tools are used. Prerequisites: IS 326 and CS 325. (3-0-3) Offered in Fall.

IS 441,Business Data Communications
Data and voice communication systems design address both local and wide-area business applications. Prerequisite: IS 326.
Co-requisite: IS 440. (3-0-3) Offered in Fall.

IS 445,Decision Support & Expert Systems,
The design and use of decision support, expert, and neural network systems to improve business opportunity identification, problem finding, and problem solving. Applications are developed using commercial software. Prerequisite: IS 326 (3-0-3) Offered in Spring.

IS 491,Independent Reading and Research
Independent investigation of problems within the area of the student's special interest, to be supervised by a faculty member. Prerequisites: Consent of instructor and Junior standing.
(Credit: Variable) Management

MGT 201, Introduction to Business
This course has been replaced by MGT 421.

MGT 221,Business Law I
Legal implications of business transactions are studied. Specific topics include: the nature of law and its place in society, especially in relation to business; contracts and property law studied by the case method; formation and operation of contracts; their significance to the economic order. (3-0-3) Offered in Fall.

MGT 222,Business Law II
A continuation of MGT 221. Agency, partnership, corporations, and negotiable instruments (uniform commercial code) of law studied by the case method. The nature and operation of the judicial process, and its significance for society and business. Prerequisites: MGT 221 or consent of instructor. (3-0-3) Offered in Spring.

MGT 314,International Business
An introductory course that studies the nature and scope of international trade and investments, international institutions, the international monetary system and exchange markets, and some of the major issues involved in the functional aspects of international business. Prerequisite: Junior standing. (3-0-3) Offered in Spring and Summer.

MGT 351,Theory of Organization and Management
Introduction to the theory and practice of management; includes the basic managerial functions--planning, organizing, leading, and controlling. Communication, motivation, and decision-making techniques are stressed. Also covered are organization structure and design, the dynamics of individual and group interaction, organization climate, managerial styles, the implications of increasing work force diversity, coping with conflict, and methods for achieving organizational improvement. Issues in international business are dealt with at relevant points. Prerequisite: Junior standing. (3-0-3) (S) Offered in Fall, Spring and Summer.

MGT 421,Human Resources Management
Introduction to the theory and practice of human resources management; basic organization and management problems arising from the employee-employer relationship; wages, recruiting, and selection; health and safety; government regulations; discrimination; unions; and changing work force demographics. Also covered are organization and design of the human resources department, techniques in wage and salary administration, benefits, labor relations, records systems, job analysis, job descriptions, human resources planning, and career planning. Prerequisite: MGT 351 (3-0-3) Offered in Fall.

MGT 450,Management Policy
Integration and application of the knowledge and skills learned in the foundation, tools and concepts, and functional field components of the undergraduate management core. Management policy considerations in different settings: private sector, government agencies, non-profit organizations, multinational enterprises. Case studies, field projects, management simulations. Prerequisites: Approximately 40 credit hours in Management, Economics, and Management Sciences; senior standing or approval of instructor. (3-0-3) Offered in Fall and Spring.

Management Sciences

MSC 115,Computers in Business
Introduction to business and software of the PC. Typically will include word processing, spreadsheets, graphics, data communications and database software. (1-0-1)
Offered in Fall.

MSC 221,Basic Probability and Statistics
Introduction to probability concepts, bayes methods and sample averages and standard deviation, normal Poisson and binomial distributions and applications, confidence intervals, hypothesis testing and contingency tests, regression methods and sample size determination. Calculus background not required. (3-0-3) Offered in Fall.

MSC 312,Introduction to Operations Management
This course has been changed to OM 312.

MSC 315,Management Science
Introduction to the use of mathematical models in the solution of industrial and business problems. Linear programming. Network analysis and simulation. Analysis of waiting lines.
Prerequisite: MATH 142 or equivalent. (3-0-3) Offered in Spring.

Marketing

MKT 371,Marketing
Introduction to the activities and decisions faced by marketing managers in modern organizations. Topics include: consumer and organizational buying behavior, marketing research, market segmentation, new product development, product line decisions pricing channels, distribution, promotion, international marketing, and introduction to marketing strategic planning. Prerequisites: ECON 201 or 212 and Junior standing. (3-0-3) Offered in Fall and Summer.

MKT 471,Marketing Research
Study of the identification, collection, and analysis of information applied to marketing decision-making. Market research topics covered include: problem formulation, value of information, research designs, questionnaire development, sampling, and data analysis. Information systems topics include: decision criteria, information requirements, and model development, estimation, and application. Prerequisites: MSC 221 or equivalent, and MKT 371. (3-0-3) Offered in Spring.

MKT 472 Communications and Consumer Marketing
In-depth study of the economic and behavioral factors that influence the purchasing behavior of consumers; analysis of the advertising and promotional flow between producers, distributors and consumers. Consumer topics include: psychological foundations, social and cultural influences, demographics, information processing role in consumer decision-making. Communications topics include: communications theories, target market identification, setting objectives and budgeting, message generation, media decisions, creative themes, and sales and trade promotion.
Prerequisite: MKT 371. (3-0-3) Offered in Spring.

MKT 478,Business Marketing
Analysis of the activities and decisions faced by marketing managers responsible for selling to organizations. Business marketing topics covered include: product/ market selection, segmenting organizational markets, industrial market research, developing demand forecasts, and cross-functional coordination required for effective marketing strategies. Personal selling topics covered include: prospect analysis, effective presentations and demonstrations, handling objections, sales closes, crossselling, maintaining account satisfaction, and negotiation tactics. Prerequisites: MKT 371 and MKT 472. (3-0-3) Offered in Fall.

MKT 481 Product, Pricing and Distribution Management
Analysis of the design & development, testing, introduction, pricing and distribution of industrial and consumer products. Product management topics include: product life cycle concept, branding decisions, packaging, new product development and product policy issues. Pricing topics include: conceptual and practical pricing methods, behavioral and economic approaches to pricing. Distribution topics include: structure and function within channels, vertical marketing systems, retailing & wholesaling, physical distribution, power & conflict within channels, and legal issues. Prerequisite: MKT 371. (3-0-3) Offered in Fall.

MKT 482,Promotion/Advertising and Pricing
This course has been replaced by MKT 486, International Marketing.

MKT 483,Sales and Sales Management
Covers the practice of sales management, its functions and techniques. Provides a realistic understanding of what sales managers actually do, how they behave, and the problems with which they contend. Focus is on four types of selling: direct, commercial, technical, and consultative. The role of the purchasing specialist is analyzed. Case studies, role playing, projects are used. Prerequisite: MKT 371 (3-0-3) Offered in Spring.

MKT 486,International Marketing
Analysis of the implications of global market dynamics on the strategies of western firms. The increasing global interdependence of various markets will be discussed. Marketing implications of the changes taking place in Western Europe, the former Soviet Union, the people's Republic of China, the Pacific-Rim countries, etc. will be studied. Topics in international marketing include: the concept of globalization; cultural aspects of marketing in international marketplaces; international market entry strategies; global advertising and promotion; political and legal issues; product pricing and distribution decisions in an international environment. Prerequisites: ECON 201 or ECON 212, and MKT 371. (3-0-3) Offered in Spring.

MKT 491,Independent Reading and Research in Marketing
Individualized instruction for students who are advanced in marketing or who have a particular interest in a specific marketing problem. Prerequisites: Submission to the instructor of a concrete program of proposed study, MKT 471, and MKT 472. (Variable credit.)

MKT 497,Marketing Seminar
Lectures in marketing topics of current interest not covered by regular course offerings. Prerequisites: MKT 471 and MKT 472. (3-0-3)

Operations Management

OM 312,Introduction to Operations Management
Operational problems studied from a systems viewpoint. Development and application of policies, techniques, and models for making decisions in the areas of product and service design, design of operating systems, production and control of the product or service. Prerequisite: Junior standing. (3-0-3) Offered in Fall and Spring.

OM 423,Operations Systems Design
Analysis and design of product, process, and operations for high-quality and low-cost production. Production process planning and capacity planning. Facilities location and layout planning. Prerequisite: OM 312. (3-0-3) Offered in Spring.

OM424, Operations Planning, Scheduling, and Control

This course has been replaced by OM425.
OM425 Simulation of Operation Systems
Computer simulation is a powerful tool for evaluating operations systems. Various software packages and cases are used. Examinations are made of the considerations in the design and statistical analysis of computer simulations. Prerequisites: OM 312 and MSC 315. (3-0-3) Offered in Spring.

OM 433,Quality Management
This course examines the role of quality in organizational effectiveness. Discussion of tools and concepts of continuous improvement in process, products, services, and internal functions of a business enterprise to continuously improve customer satisfaction. Review of the Baldrige Award criteria and ISO 9000. Prerequisites: OM312 and MSC 221 or equivalent. (3-0-3) Offered in Spring.

OM 442,Materials Management
The planning and management of the materials functions in manufacturing, purchasing, and distribution. Topics include productions planning, master production scheduling, material requirements planning, distribution requirements planning, inventory control, operation scheduling, capacity planning, and implementation. Prerequisites: OM 312 and MSC 315. (3-0-3) Offered in Fall.

OM 491,Independent Reading and Research
Independent investigation of problems within the area of the student's special interest, to be supervised by a faculty member. Prerequisites: Consent of instructor and Junior standing. (Credit: Variable)

CHEMICAL ENGINEERING

Chairman: Dr. Hamid Arastoopour 124 Perlstein Hall Extension 73040
Professors: Arastoopour, B. Bernstein, Gidaspow, Linden (Max McGraw Professor), Selman, Shutov, Wasan
Associate Professors: Beissinger, Cinar, Parulekar
Assistant Professors: Teymour (S.C. Johnson Polymer Assistant Professor), Venerus
Adjunct Professors: Ismaili, Lindahl
Research Associate Professor: Nikolov

Faculty Emeritus: Swanson

Chemical engineering is concerned with the design, development, and management of facilities to convert raw materials into useful products. The engineer must incorporate into this responsibility the economical use of the raw materials, preservation of the environment, and profitability to business.

Engineering is largely a team effort, and the department believes that development of the individual's ability to work effectively as part of a team is important. To accomplish this, the laboratory program is carried on by teams of students. These laboratories attempt to reinforce the concepts developed in the lectures and to show the application of chemical engineering principles to the solution of national problems. Because individual instruction is so important to the student's growth, laboratory sections are small and a high level of personal contact between student and instructor is maintained.

The field of chemical engineering is so broad that the undergraduate program is divided into several phases. The first two years are devoted to the fundamental sciences, mathematics, and engineering sciences, which are necessary to all branches of engineering. The last two years are particularly concerned with the development of professional skills. The emphasis is on the basic knowledge and applications of the transport processes, thermodynamics and kinetics of processes, automatic control, and design. In addition to developing engineering competence, the program examines the economics and societal implications of chemical engineering. Special programs exist to accommodate the student who wants to develop a background in related areas.

Students may choose a professional specialization in

Energy/Environment/Economics (E3)
Environmental Engineering
Polymer Science and Engineering
Bioengineering
Process Design and Operation
as described on the following pages. Students also may choose the following minors (see page 28):

Air Force Aerospace Studies
Applied Mathematics
Fire Protection and Safety Engineering
Food Technology
Management for Non-Business Majors
Military Science
Naval Science

All students must include in their minor program or as a technical elective CHE 426 (Statistical Tools for Engineers) or at least one three-credit-hour engineering science course. Students who plan to go to graduate school are advised to take CHE 535 (Applications of Mathematics to Chemical Engineering) as a technical elective.

Undergraduate Program in Chemical Engineering

Required Core	Credit Hours
CHE 111, 112, 202, 301, 303, 317, 351, 406, 418, 422, 436, 439, 451, 495, 496	40

Mathematics Requirements

MATH 151, 152, 251, 252 18

Physics Requirements

PHYS 103, 104, 203 11

Chemistry Requirements

CHEM 124, 125, 237, 239, 243, 244, 247 25

Computer Science Requirement

CS 105 2

Engineering Course Requirements

EG 105, MECH 200, EE 383 8

Humanities and Social Sciences Requirements

ENGL 101, HUM 100-level	6
Humanities Electives (300-level and above)	6
Social Science Electives (6 hours 300-level and above)	12
Electives	
Technical Electives	12
Total Credit Hours	**140**

Curriculum

First Semester	**Lect**	**Lab**	**Cred. Hrs.**
MATH 151	4	2	5
CHEM 124	3	3	4
CS 105	2	1	2
CHE 111	0	2	1
ENGL 101*	3	0	3
Social Sciences Elective*	3	0	3
Totals	15	8	18
Second Semester			
MATH 152	4	2	5
PHYS 103	3	0	3
CHEM 125	3	3	4
EG 105	1	2	
HUM 100-level course*	3	0	3
CHE 112	0	2	1
Totals	14	9	18
Third Semester			
MATH 252	4	0	4
CHE 202	2	2	3
CHEM 237	3	4	4
PHYS 104	3	3	4
MECH 200	3	0	3
Totals	15	9	18
Fourth Semester			
MATH 251	4	0	4

PHYS 203	3	3	4
CHEM 239	3	0	3
CHEM 243	4	0	4
CHE 301	3	0	3
Totals	17	3	18

Fifth Semester

CHE 303	4	0	4
CHE 351	3	0	3
CHEM 244	3	0	3
CHEM 247	2	4	3
Humanities Elective*	3	0	3
Totals	15	4	16

Sixth Semester

CHE 317	1	3	2
CHE 439	3	0	3
EE 383	3	0	3
Technical Elective	3	0	3
Humanities Elective*	3	0	3
Social Sciences Elective*	3	0	3
Totals	16	3	17

Seventh Semester

CHE 418	1	3	2
CHE 422	4	0	4
CHE 436	3	3	4
CHE 495	1	2	2
Technical Elective	3	0	3
Social Sciences Elective*	3	0	3
Totals	15	8	18

Eighth Semester

CHE 406	3	0	3
CHE 451	2	0	2
CHE 496	2	2	3
Technical Elective	3	0	3
Technical Elective	3	0	3
Social Sciences Elective*	3	0	3
Totals	16	2	17
Total credit hours			140

This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

*Humanities and social sciences components of the General Education Program (see page 19 for details).

Professional Specializations

1. Energy/Environment/Economics (E3) -- Program Adviser: H. Arastoopour
   Students selecting the E3 specialization take three or six-credit-hour courses in Special Problems or Research in Energy (CHE 429 or MAE 491/497 or EE 491/497). In addition they choose three or four courses, at least one course from each of the following three areas. Appropriate substitutions may be made with the approval of energy technology program advisers.

   Energy Sources and Conversion--CHE 430, 460, 465, 481, 482, 483, EE 331, 431, and MAE 450.

   Energy and Power Distributon and Utilization/Environment--CHE 461, 488, 489, MAE 452, 453, 454, and ENVE 450, 463, 476, 480, EE 411, 419, 420, 434/438.

Energy Analysis, Economics, and Policy--CHE 426, 541, 543, CS 480, ECON 423, LAW 330, and PS 338.

2. Environmental Engineering -- Program Adviser: H. Arastoopour Students must take the following three courses: ENVE 404, 463, 480. In addition they should choose two courses from the following: CHE 426, ENVE 401, 410, 450, 476 Appropriate substitutions may be made with the approval of the program adviser.

3. Polymer Science and Engineering -- Program Adviser: D. Venerus
The program embraces polymer chemistry, characterization, structure, and properties, and the manufacture of polymeric raw materials and their processing into finished products. Five courses (15 credit hours) should be taken as follows: CHE 450 (required), at least three courses (9 credit hours) chosen from CHE 492, 538, 555, 575, 581, CHEM 535, METM 480, 542, 581, and up to one course (3 credit hours) from the following: CHE 426, 460, 489, CHEM 423, 435, 537, MAE 422, 479, and FST 404. Appropriate substitutions may be made with the approval of the program adviser.

4. Bioengineering -- Program Advisers: S. Parulekar and R. Beissinger
Bioengineering has two career specializations:
Biomedical Engineering: The five elective courses (15 credit hours) are allocated as follows: BIOL 107, 117, and CHE 410/510 must be taken. Two electives are chosen from BIOL 401, 403, 430, and CHE 426, 492.

The Biotechnology option, designed for students interested in careers in biochemical engineering and biotechnology, is described on page 81. Students choosing this option may substitute CHE 426 for CHE 487 with approval of the program adviser.

5. Process Design and Operation -- Program Adviser: A. Cinar
For students interested in design, operation, monitoring, optimization, and control of chemical processes. At least three courses (9 credit hours) must be taken from the following: CHE 426, 431, 437, 507, 508, 528, 530, 532, 560, and MATH 486. Up to two courses may be selected from the following (only one ENVE course): CHE 402, 430, 455/557, 461, 465, 489, 492, ENVE 410, 450, 476, and FST 403.

Course Descriptions

CHE 111,Computers in Engineering I
Introduction to engineering and software of the PC. Typically will include word processing, spreadsheets, graphics, data communications and database software. (Same as CS 111.)-(2-0-1).

CHE 112,Computers in Engineering II
A continuation of CHE 111. Application of PC software to engineering problems with emphasis on numerical methods and statistical techniques. Prerequisite: CHE 111. (Same as CS 112.)-(2-0-1)

CHE 202,Material and Energy Balances
Material and energy balances for engineering systems subjected to chemical and physical transformations. Calculations on industrial processes. Prerequisites: CS 105, MATH 152, and one year of chemistry. (2-2-3)

CHE 301,Fluid Mechanics and Heat Transfer Operations
Flow of fluids and heat transfer. Fundamentals of fluid flow and heat transfer design equations as applied to selected unit operations. Prerequisites: CHE 202, MATH 251. Corequisite: CHEM 243, MATH 252. (3-0-3)

CHE 303,Mass Transfer Operations
Mass transfer in stagewise and continuous contacting equipment. Mass transfer design equations as applied to selected unit operations. Unsteady state operations in mass transfer equipment. Prerequisites: CHE 301 and CHEM 244. (4-0-4)

CHE 317,Chemical Engineering Laboratory I
Laboratory work in the unit operations of chemical engineering; fluid flow, heat transfer, and other selected topics. Prerequisite: CHE 301. (1-3-2)

CHE 351,Chemical Engineering Thermodynamics
Laws of thermodynamics and their application to chemical engineering operations. Corequisites: CHEM 243, 244. (3-0-3)

CHE 402,Introduction to Microelectronics Fabrication Technology
Fundamentals of integrated circuit technology. Epitaxy and doping of epitaxial layers. Film deposition techniques. Bipolar and MOS integrated circuit devices. Integrated and hybrid circuit fabrication. (3-0-3)

CHE 406,Transport Phenomena
The equations of change in different orthagonal coordinate systems (mass, momentum, and energy transport). Velocity distribution in laminar and turbulent flow. Formulation and analytical solutions to the problems of viscous flow, molecular diffusion, heat conduction and convection. Prerequisites: CHE 301, CHE 303, and MATH 252. (3-0-3)

CHE 410,Transport Phenomena in Living Systems
Introductory course for seniors and first-year graduate students. Elements of human anatomy and physiology. Principles of transport phenomena are applied to biomedical and other applied problems.

Topics include: flow properties of blood; pharmacokinetics; heat, mass, and momentum transfer in cardiovascular systems; and analysis of organ functions including kidney, lung, placenta, liver, and artificial organs. Prerequisites: CHE 301 and CHE 303. (3-0-3)

CHE 418, Chemical Engineering Laboratory II
Laboratory work in distillation, humidification, drying, gas absorption, filtration, and other areas. Prerequisites: CHE 303, CHE 317, and CHEM 247. (1-3-2)

CHE 422,Chemical Reaction Engineering
Introduction to the fundamentals of chemical kinetics. The design, comparison, and economic evaluation of chemical reactors. Emphasis on homogeneous systems. Prerequisite: CHE 303. (4-0-4)

CHE 426,Statistical Tools for Engineers
Probability distributions, random sampling, independence, significant tests, design of experiments, regression, time series analysis, statistical process control, and introduction to multivariate analysis. Prerequisite: Junior standing. (3-0-3)

CHE 430, Petrochemical Process Operations and Design
Chemical and engineering aspects of current petrochemical and petroleum refining processes will be emphasized, including chemical conversions (catalytic and thermal), physical separations, and evaluation of alternatives. Design and simulation of refinery separation systems with emphasis on distillation columns. Prerequisite: CHE 495. (3-0-3)

CHE 431,Artificial Intelligence Applications in Engineering
Expert system architecture, knowledge representation, inferencing, expert system shells, commercial expert systems, expert system design methodology, real-time expert systems, numerical network applications. Emphasis on expert systems in process fault diagnosis, process control, maintenance, product specification and design. Prerequisite: Consent of the instructor. (3-0-3)

CHE 436,Process Control
Theoretical background and practical application of automatic controllers. Dynamics of measurement; automatic controllers; closed loop systems; system design. Special emphasis on chemical process applications. Prerequisite: CHE 303. (3-3-4)

CHE 437 Discrete Time Systems and Computer Control
Sampling of continuous-time signals, Z-transforms, modeling, digital controller design using state-space and pole-placement design methods, adaptive control and self-tuning regulators. Emphasis on chemical process systems, applications. Prerequisite: Consent of instructor. (3-0-3)

CHE 439 Numerical and Data Analysis
Utilization of numerical methods to find solutions to a variety of chemical engineering problems. Emphasis placed on problem formulation, development of computer code, and interpretation of results. Techniques covered include: systems of algebraic equations, linear regression, and statistics. Numerical differentiation and integration, solution of ordinary and partial differential equations. (3-0-3)

CHE 450,Principles of Polymer Science and Engineering
This introductory course deals with the physics, chemistry, and engineering of polymer systems. Classical concepts and theories as well as recent developments are addressed. Topics to be discussed include: characterization, structure and properties, thermodynamics, polymerization reaction engineering, mechanical behavior, rheology, and processing. (3-0-3)

CHE 451,Chemical Process Thermodynamics
Second law analysis of cooling, separation, combustion, and other chemical processes. Chemical reaction equilibrium and processing applications. Prerequisite: CHE 351. (2-0-2)

CHE 455,Polymer Processing
Considerations of transport processes in the polymer industry. Analysis of heat, mass, and momentum transfer in molten polymers and polymer solutions. The polymer flow processes to be discussed will include: extrusion, calendering, fiber spinning, injection molding, mixing, and polymerization reaction. Prerequisites: CHE 301, 303. (3-0-3)

CHE 460,Interfacial and Colloidal Phenomea with Applications
Applications of the basic principles of physical chemistry; surfactants and interfacial phenomena, surface and interfacial tension, adsorption of surfactants from solutions, spreading, contact angles, wetting, electrokinetic phenomena, rheology, dynamic interfacial properties, mass transport across interfaces. Applications include emulsions, foams, dispersions, tribology, detergency, flotation, enhanced oil recovery, suspension and emulsion polymerization and liquid membranes. Hands-on laboratory experience for making measurements of interfacial properties will be emphasized. Prerequisite: CHEM 243. (2-2-3)

CHE 461,Equilibrium-Stage Calculation Techniques
Equilibrium-stage concept. Algebraic multicomponent calculations for predicting fluid properties. Graphical methods for multicomponent distillation, absorption, stripping, and extraction. Rigorous multicomponent, multistage methods based on material and energy balances and phase equilibrium relationship. Continuous contacting operations. Thermodynamic efficiency. Prerequisite: CHE 303. (3-0-3)

CHE 465,Electrochemical Energy Conversion
Thermodynamics, kinetic and masstransfer fundamentals of electrochemical devices. Potential and potential measurement. Batteries and fuel cells. Fundamentals of corrosion and corrosion prevention. Prerequisites: CHEM 244 and CHE 303, or comparable masstransfer course. (3-0-3)

CHE 481 Fundamentals of Gas and Petroleum Reservoirs
Introduction to petroleum geology and formation of oil and gas. Reservoir and fluid properties. Flow of gases and liquids through porous media. Darcy's Law and its application in oil and gas reservoirs. Summary of unconventional gas reservoirs and introduction to fundamentals of enhanced oil recovery. (3-0-3)

CHE 482,LNG Fundamentals
Properties of liquid and gas mixtures at low temperatures. Vapor liquid equilibria. Thermodynamic analysis of natural gas liquefaction processes. Storage and transportation of LNG. Prerequisite: CHE 351 or MAE 205. (3-0-3)

CHE 483,Synthetic Fuels
Introduction to synthetic fuel processes. Analysis, design, and operation features of synthetic fuel conversion processes. Fluidized beds, packed beds, and dilute gas solids systems. The principles of low, medium, and high BTU coal gasification processes. Prerequisite: CHE 351 or MAE 205. (3-0-3)

CHE 486,Applied Particulate Technology
Applications of the technology to industrial processes; sampling, collection, characterization, segregation, flow handling, storage, agglomeration, mixing, and transport of particles. Systems include powders, emulsions, suspensions, dusts, and mists. (3-0-3)

CHE 487,Introduction to Biotechnology
Application of engineering principles to the biochemical industries. Topics include microbial pathways, energetics and control systems, enzyme and microbial kinetics, and the design and analysis of biological reactors. Corequisite: CHE 422. (3-0-3)

CHE 488,Energy Transmission and Distribution
Review of compressible and incompressible flow. Steady state transmission, distribution, compression, and flow measurements of natural gas. Transient flow of gas and liquid fuels. Summary of the two-phase flow, with emphasis on pneumatic conveying of solid fuels and transmission and distribution of slurry. New concepts and technologies in transmission and distribution of energy. Prerequisite: CHE 301 or MAE 305. (3-0-3)

CHE 489,Fluidization
Regimes of fluidized beds, rehology behavior of fluidized beds, particles classification, properties of the bubble, emulsion, elutriation, and jet. Fluid mechanic theory and heat and mass transfer in fluidized bed. Design aspects of fluidized bed and pneumatic conveying. Industrial applications of fluidized beds (catalytic reactors, drying, coal conversion, waste treatment). Prerequisite: CHE 303. (3-0-3)

CHE 492,Senior Problems
A senior research course which allows the student to pursue a largely independent study and research program in areas of current staff interest. Prerequisites: Senior standing and a GPA in major courses of 3.0 or better. (Credit: Variable; maximum 3 credit hours.)

CHE 495,Chemical Process Design I
Introduction to design techniques and economic aspects of chemical processes. The technical and economic aspects of equipment selection and design, alternative methods of operation. Prerequisite: CHE 303. (1-2-2)

CHE 496,Chemical Process Design II
Comprehensive problems are assigned which include heat, material and economic balances, unit operations and processes, kinetics and thermodynamics. The major responsibility is placed on individuals or small groups for the optimum design and selection of equipment, and for the calculations of required sizes, plant layout, and cost analyses. Prerequisite: CHE 495. (2-2-3)

Graduate Courses
Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

CHEMISTRY

Acting Chairman: Dr. Robert Filler 124 Wishnick Hall
Extensions 73425, 73910
Professors: Filler, Johnson, Lykos, Schug
Associate Professor: Eisenberg
Adjunct Associate Professor: Stetter
Assistant Professors: Mandall, Smotkin
Visiting Assistant Professor: Frauenhoff
Faculty Emeriti: Fanta, Miller, Neubert, Wood

Chemistry deals with the properties of individual atoms, with the behavior of complex biological systems -- and with everything in between. Because of its breadth and its molecular focus, chemistry can indeed be considered the universal natural science. While core chemistry has traditionally been described in terms of organic and inorganic chemistry, a more modern description relates the application of chemical language and problem-solving methods to the world around us to include biochemistry, materials chemistry, and environmental chemistry. The courses described here are designed to provide both majors and nonmajors with an understanding of chemical principles and processes as a foundation for further studies in basic or applied science or as a strong preparation for a career in chemistry or in a related field. Because chemistry is predominantly an experimental science, our programs stress modern laboratory experience.

The IIT chemistry graduate has many opportunities for further study and/or for a professional career, either by building directly on his or her chemical education or by combining chemistry with other areas of study. Recent IIT chemistry graduates are engaged in a wide range of activities, including research and development in the chemical industry and in government laboratories, administration of clinical laboratories, and careers in law, medicine, forensic chemistry, and journalism. The B.S. program in chemistry is particularly geared toward students preparing for professional careers in basic and applied chemistry, while the B.A. program in chemistry offers greater breadth for students planning careers in chemistry-related areas. Within each program a biochemistry option is available (see Biochemistry p. 69). A background in biochemistry provides outstanding preparation for medical and dental school and graduate study which leads to rewarding careers in medicine, health professions, dentistry, academia, research laboratories, hospitals, and industry. Persons whose career goal is to do research should know that the cost of graduate school (tuition and living allowance) is generally borne by the department in the form of teaching or research assistantships.

Chemistry-B.S.

Required Core Major Courses	**Credit Hours**
CHEM 113, 114, 124, 125, 237, 239, 240, 243, 244, 247, 321, 334, 335, 345, 347, 415, 416	56
Mathematics Requirements	
MATH 151, 152, 251, 252	18
Physics Requirements	
PHYS 103, 104, 203	11
Computer Science Requirements	
CS 105	2
Humanities and Social Sciences Requirements	
ENGL 101, HUM 100-level	6
Humanities Electives (300-level and above)	6
Social Sciences Electives (6 hours 300-level+)	12

Electives

Technical Electives	9
Free Electives	12

Total Credit Hours **132**

Bachelor of Science Curriculum

First Semester	**Lect**	**Lab**	**Cred. Hrs.**
CHEM 124	3	3	4
MATH 151	4	2	5
PHYS 103	3	0	3
CS 105	2	1	2
ENGL 101*	3	0	3
CHEM 113	0	2	1
Totals	15	8	18
Second Semester			
CHEM 114	0	2	1
CHEM 125	3	3	4
MATH 152	4	2	5
PHYS 104	3	3	4
HUM 100-level course*	3	0	3
Totals	13	10	17
Third Semester			
CHEM 237	3	4	4
CHEM 247	2	4	3
PHYS 203	3	3	4
MATH 251	4	0	4
Totals	12	11	15
Fourth Semester			
CHEM 239	3	0	3
CHEM 240	1	4	2
CHEM 243	4	0	4
MATH 252	4	0	4
Humanities or Social Sciences Elective*	3	0	3
Totals	15	4	16
Fifth Semester			
CHEM 244	3	0	3
CHEM 334	2	0	2
CHEM 335	0	6	2
Humanities or Social Sciences Electives*	6	0	6
Free Elective	3	0	3
Totals	14	6	16
Sixth Semester			
CHEM 321	2	6	4
CHEM 345	4	0	4
CHEM 347	0	4	1
Humanities or Social Sciences Electives*	3	0	3
Technical Elective**	3	0	3
Free Elective	3	0	3
Totals	15	10	18

Seventh Semester

CHEM 415	3	0	3
CHEM 416****	1	7	3
CHEM 450	0	8	2
Free Elective	3	0	3
Technical Elective**	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	13	15	17

Eighth Semester			
CHEM 451	2	0	2
CHEM 487	0	12	4
Technical Elective**	3	0	3
Free Elective	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	11	12	15
Total credit hours			132

*Humanities and social sciences components of the General Education Program (see page 19 for details).

**Requires approval of the Department and must be selected from courses designated by the department.

****Certain advanced laboratory courses in other departments (physics, biology) may be substituted; requires approval of the Department.

Bachelor of Arts Concentration in Chemistry

The B.A. program, which provides greater flexibility than the B.S. program in the selection of courses, is appropriate for students planning chemistry-related careers in computer science, environmental science, forensic science, management, law, medicine or medical sciences, teaching, writing, and other fields. The B.A. chemistry curriculum listed below is consistent with the American Chemical Society's guidelines for approved bachelor's programs in chemistry.

Several minors, for example, those in Database Management, Digital Electronics, Programming Languages, and Software Engineering (all computer related), Applied Chemistry, Biochemistry, Environmental Engineering, Forensic Science, Management, Technical Communications, and Toxicology can be combined with a concentration in chemistry to give students even broader opportunities for professional careers. Individual programs are arranged with the aid of faculty advisers. (See listing of minors beginning on p. 28.)

The course requirements for the B.A. program are:

A. All requirements for the B.A. program outlined on page 22.

B. CHEM 113, 124, 125, 237, 239, 240, 243, 244, 247, 321, 345, 415, 450, 451, and one technical elective.

C. PHYS 103, 104, and 203. This satisfies the natural sciences requirement for the B.A. degree.

D MATH 151, 152, and 251. With CS 105, these satisfy the math and computer science requirements for the B.A. degree.

The required chemistry, mathematics, and physics courses form a sequence. Students should be guided by the following model:

Bachelor of Arts Curriculum (Chemistry and Basic Science Content)

First Semester	**Lect**	**Lab**	**Cred Hrs.**
CHEM 113	0	2	1
CHEM 124	3	3	4
MATH 151	4	2	5

CS 105	2	1	2
Second Semester			
CHEM 114	0	2	1
CHEM 125	3	3	4
MATH 152	4	2	5
PHYS 103	3	0	3
Third Semester			
CHEM 237	3	4	4
MATH 251	4	0	4
PHYS 104	3	3	4
Fourth Semester			
CHEM 239	3	0	3
CHEM 240	1	4	2
CHEM 243	4	0	4
PHYS 203	3	3	4
Fifth Semester			
CHEM 244	3	0	3
CHEM 247	2	4	3
Technical Elective*			Variable
Sixth Semester			
CHEM 345	4	0	4
Seventh Semester			
CHEM 415	3	0	3
CHEM 450	0	8	2
Eighth Semester			
CHEM 321	2	6	4
CHEM 451	2	0	2
STX 411	3	0	3

*Possible electives include CHEM 334, 335, 416, 423, 435, and 455; non-CHEM electives consistent with a student's program may be substituted. Advance approval of the Department is required.

For a detailed description of the B.A. program, see page 22.

Professional Specialization

Students may select a minor from a large number listed beginning on page 28 in this Bulletin. Examples include Biochemistry, Environmental Engineering, and Polymer Science and Engineering.

Course Descriptions

CHEM 113,114 Computers in Science I,II
Introduction to computer applications in chemistry via case studies, typically including word processing, spreadsheets, graphics, data communications, and database software. Mentoring and advising by departmental faculty and upperclassmen. Strengthening of student leadership, cooperation, and study skills. (0-2-1); (0-2-1)

CHEM 124, Principles of Chemistry I
Foundations of chemistry, atoms and molecules, stoichiometry of chemical reactions, thermochemistry, properties of gases, states of matter, chemical solutions, kinetics, equilibria. (3-3-4)

CHEM 125,Principles of Chemistry II
Molecular basis for chemical reactivity; atomic structure, periodicity, chemical bonding, and introduction to thermodynamics. Chemistry of selected elements and their compounds. Prerequisite: CHEM 124. (3-3-4)

CHEM 126 Principles of Chemistry II
Same as CHEM 125 except without the laboratory. Prerequisite: CHEM 124. (3-0-3)

CHEM 130,Chemistry in Action
An introductory course for non-technical majors designed to inform students about the impact of chemistry on society. Special emphasis will be placed on materials, sources of energy, environmental problems, drugs, and living systems. (3-0-3)

CHEM 237 Organic Chemistry I
General principles of synthetic and theoretical organic chemistry. Prerequisite: CHEM 125 (or consent of instructor). (3-4-4)

CHEM 239,Organic Chemistry II
Continuation of CHEM 237. (3-0-3)

CHEM 240,Organic Chemistry Laboratory
Laboratory part of CHEM 239. Corequisite: CHEM 239. (1-4-2)

CHEM 243, 244,Physical Chemistry I, II
A study of the equilibrium properties of chemical systems based on the laws of thermodynamics, transport properties, and chemical kinetics. Prerequisites: CHEM 125 (or consent of instructor), MATH 251. Corequisite: PHYS 203. (4-0-4); (3-0-3)

CHEM 247,Analytical Chemistry
Introduction to the theory and applications of analytical chemistry. Laboratory emphasis on obtaining and interpreting quantitative data. Statistical data analysis, equilibrium expressions, pH, volumetric and gravimetric analysis, fundamentals of spectroscopy, fundamentals of electrochemistry, and analytical separations. Laboratory experiments include acid-base behavior, potentiometry with ion-specific electrodes, spectroscopy (UV-visible and atomic absorption), and chromatography (ion- exchange, high pressure liquid, and gas-liquid). Prerequisite: CHEM 125 (or consent of instructor). (2-4-3)

CHEM 297,Special Projects
Research projects for first- and second- year students under the direct supervision of a faculty member. (Credit: Variable)

CHEM 321,Instrumental Analysis
Theory and application of instruments in chemical procedures. Prerequisites: CHEM 244, 247. Pre- or corequisite: PHYS 203. (2-6-4)

CHEM 334,Spectroscopic Methods in Identification and Analysis
Characterization and analysis by mass, vibrational, nuclear magnetic resonance, and electronic spectroscopy. Structure-spectra correlations applied to organic and inorganic compounds with examples drawn from diverse areas, e.g., pollutants, toxic materials, polymers, etc. Prerequisites: CHEM 239, 247. (2-0-2)

CHEM 335,Spectroscopic and Separation Techniques
Characterization of prepared or separated organic compounds by chromatographic, chemical, and spectroscopic methods. Prerequisites: CHEM 240, 247; corequisite: CHEM 334. (1-8-2)

CHEM 345,Physical Chemistry III
Introduction to modern physical chemistry, including quantum theory, spectroscopy, statistical mechanics, and molecular dynamics. Prerequisites: CHEM 244, CHEM 247. (4-0-4)

CHEM 347,Physical Chemistry Laboratory
Experiments in classical and modern physical chemistry. Corequisite: CHEM 345. (0-4-1)

CHEM 415,Inorganic Chemistry
Survey of inorganic chemistry with emphasis on the modern concepts and theories of inorganic chemistry and electronic and geometric structure of inorganic compounds. Prerequisite: CHEM 345. (3-0-3)

CHEM 416,Advanced Chemistry Laboratory
An advanced laboratory with emphasis on synthesis and characterization of inorganic and organometallic compounds. Prerequisites: CHEM 240, 321, 345. (1-7-3)

CHEM 423,Chemical Microscopy
Survey of the use of the polarized light microscope and its application to various technical fields. Students may elect one of the following options: polymers, criminalistics, mineralogy, air pollution, fibers, crystallography, small particle identification, polymorphism or hot stage methods, and their laboratory assignments will be based on the option chosen. Prerequisites: CHEM 237, 244, 247. (1-6-3)

CHEM 435,Introduction to Polymers
An introduction to polymer science with major emphasis on the background, nomenclature, and synthesis. Selected processing and characterization techniques and applications to day-to-day encounters with modern intelligent polymeric materials are introduced. Prerequisites: CHEM 239, 244 or consent of instructor. (3-0-3)

CHEM 450,Introduction to Research
Required for chemistry majors in the B.S. and B.A. programs. Designed to give research experience in one of the laboratories of the department. Prerequisites: CHEM 334, 335, 345. (0-8-2)

CHEM 451,Modern Techniques in Chemical Literature
A guide to the use of traditional and automated methods for the storage and retrieval of chemical information. Prerequisites: CHEM 239, 243. (2-0-2)

CHEM 452,Computers in Experimental Chemistry
Fundamentals of interfacing laboratory experiments to digital computers. Analog-to-Digital and Digital-to-Analog converters, timers, operational amplifiers, programmable amplifiers, etc. Real time data acquisition and control hardware and software. Data analysis and graphical display. Prerequisites: CHEM 244, 247 (or consent of the instructor), and CS 105 or equivalent. (2-3-3)

CHEM 453,Chemometrics
Signal processing, data analysis, and data enhancement. Partial least squares and non-linear regression analysis. Pattern recognition. Expert systems. Prerequisites: MATH 252 or consent of instructor. (3-0-3)

CHEM 454,Computer Applications in Chemistry
A numerical methods and computer applications course for chemists; emphasis on software rather than hardware; results of numerical analysis and linear algebra presented and applied to solution of chemical problems. Prerequisites: CS 100 or 105, MATH 152, CHEM 345. (3-0-3)

CHEM 455,Advanced Organic Chemistry
Physical organic chemistry; stereochemistry; organic reaction mechanisms. Prerequisites: CHEM 239, 244. (3-0-3)

CHEM 456,Undergraduate Seminar
(1-0-1)

CHEM 487,Senior Thesis in Chemistry
Original work carried on by the student under the guidance of a staff member. A careful search of the literature is required before the study is begun and continued reference to the chemical literature is expected as the work progresses. A written resume is required. {0-2-4)

CHEM 497,Special Projects
For juniors and seniors. (Credit: Variable)

Graduate Courses
The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

CHEM 535 Advanced Polymers Chemistry

CHEM 537 Polymer Chemistry Laboratory

CHEM 538 Physical Biochemistry

CHEM 547 Advanced Analytical Chemistry

CHEM 550 Structural and Quantum Chemistry

CHEM 552 Chemical Kinetics

CHEM 553 Statistical Thermodynamics

CHEM 555 Organic Synthesis

CITY AND REGIONAL PLANNING

Chairman: Mr. Peter BeltemacchiS.R. Crown HallExtension 73261
Professor: Land
Associate Professors: Beltemacchi, Schmocker, Thomas

Planning is both science and art; it is rooted in the practical, factual, and measurable, but goes beyond into the realm of ideas in order to suggest alternatives and fresh possibilities. Since the task of the planner is to help create a human environment, he or she must develop the ability to understand the human situation, to analyze, to discover what is important, and to synthesize work from many diverse fields into an organic whole. This approach leads beyond problem solving to the expression of social aims and aspirations. The aim of the department is to develop professionals who think critically and work creatively.

Chicago, Illinois, and the Midwest reflect the unprecedented problems and new possibilities presented by modern society and its technology. Chicago uniquely provides a diverse set of resources for research and for applied studies. The department offers studio course work in housing, city planning, and regional planning. Additional seminars and lectures are available in planning practice, environmental planning, and the history of cities.

A planning option is available to students in the architecture program. Students from other departments may take courses in city and regional planning as electives or as a structured minor. Consult the department for advice on appropriate courses.

Course Descriptions

CRP 203,Housing and Housing Types
The planning of rooms, houses, and groups of houses. Analysis of climatological, physical, psychological, and social needs and their influence on the planning of housing. Government regulations, costs and financing and their impact on housing. Includes single-family detached, row housing, walk ups, and low-rise construction. Limited work in other buildings. Lectures, seminars, and drawing problems. Prerequisite: Drawing ability. (0-8-4)

CRP 204,Housing and Community Developments
Neighborhood and community theory and application. Housing, parks, shopping, work places and their relationships in size and location. Related infrastructure, including traffic, potable water, storm drainage, sewerage, natural gas, and electric. Prerequisite: CRP 203. (0-8-4)

CRP 207:, 208,City and Regional Planning I:, II
Planning at different scales. Human and social factors in planning. Importance. Orientation. Density. Housing types. The dwelling in history. Origin of settlements. Buildings in settlements. Housing developments. Functional examination of the community. The whole and the part. The settlement. (3-9-6); (3-9-6)

CRP 307,Elements of City Planning
Theory of city planning and its application to new construction and to reconstruction of existing cities. The disposition of the various functions and activities of a city into a mutually supportive system. The acquisition and analysis of physical, social, and economic information. City prototypes and their application to specific locations. Government codes and regulations and their use and effect on cities. Prerequisite: CRP 203, CRP 204, or consent of instructor. (0-8-4)

CRP 308,City Planning and Replanning
The application of city planning theory to a specific area. Planning for the reuse of existing cities and for new construction. A project that applies various planning principles to an actual situation is the primary effort. Prerequisite: CRP 307. (0-8-4)

CRP 309:, 310,City and Regional Planning III:, IV
Larger settlements. Density. Effect of size on city form and development. Scale. Elements of cities. Nature of cities. Reconstruction of cities. Pre-industrial, industrial, and post-industrial settlements.

Balance. Proportion. Topographical and environmental considerations. Prerequisites: CRP 207, CRP 208. (3-9-6); (3-9-6)

CRP 311:, 312,Seminar III:, IV
Readings, written assignments, and discussions related to work in CRP III and IV. (2-0-2); (2-0-2)

CRP 407:, 408,City Planning Practice I:, II
Program and procedure. City planning techniques and methods as developed in planning commissions. Technical experience as a procedural guide. General background knowledge of the scope and types of office techniques and tools used in the preparation of a city plan. (2-0-2); (2-0-2)

CRP 413:, 414,Landscape Work I:, II
Selection and use of plant materials in relation to architectural work. Small-scale works beginning with the house and garden. Groups of buildings. The settlement and its elements as landscape problems. Prerequisite: Consent of instructor. (2-0-2); (2-0-2)

CRP 417:, 418,City and Regional Planning V:, VI
Area planning. Location and distribution of settlements. New settlements. Nature of regions. Factors determining a region. Geographic and economic considerations. Scale, size, balance, proportion. Density. Idea. Prerequisites: CRP 309, 310. (3-9-6); (3-9-6)

CRP 419:, 420,Seminar V:, VI
Readings, written assignments, and discussions related to work in CRP V, VI. (2-0-2); (2-0-2)

CRP 421,Seminar in History and Architecture of Cities
Selected topics examined in depth. Topics will be announced prior to registration each semester. (2-0-2)

CRP 425:, 426,History and Architecture of` Cities I:, II
Selected topics in the history and development of human settlements. Examination of the forces affecting city development in history. These courses are taught as seminars and meet for one three-hour period per week. (3-0-3); (3-0-3)

CRP 441,The Airport --An Introduction
Review of aircraft types and their evolution and use; airport development and planning. General aviation, regional, metropolitan, and major hub airport requirements; anatomy of the airport and requirements. Readings, written assignments, airport visits, and reports. Future airport/space port needs are analyzed. Prerequisite: Consent of instructor. (3-0-3)

CRP 442,The Airport and the Community
Government and corporate responsibilities: land use and zoning; airport siting principle; location, climate, and topography; user requirements, access, ground transportation; utilities; noise contours, and other pollutants; EIS; reading and written assignments, airport visits; role of airport technical staff and consultants today. Prerequisites: Consent of instructor and CRP 441. (3-0-3)

CRP 443,The Airport and Regional/National Planning
Governmental planning agencies' effect on design, construction, and airport operations; airport airways system; airport structure; airfield elements; apron-terminal complex; service areas and facilities. Airport operating costs-usage fees and charges; airport standards; airline and tenant standards; airport vehicle requirements; site and control center visits; reading assignments and reports. Prerequisites: Consent of instructor and CRP 441 and 442. (3-0-3)

CRP 444,Airport Design
Two distinctive airport design projects-a private general aviation airport and a public regional airport; criteria, programming, siting, and local considerations; preparation of facility analysis, site adaptation, apron-terminal complex, and airport access consideration; airport site visits; reading assignments. Prerequisites: CRP 442 and 443. (3-0-3)

CRP 445,Airport Capacity Analysis
Airfield capacity and delay factors; existing airfield demand and forecast demand; effect of planned or required airport improvements on capacity. Analytical and computer simulation models; monetary valuations; delay versus improvement costs. Airfield pavement configurations, navigational aids, meteorological considerations, aircraft types, environmental concerns, gate availability, and other factors which affect airport capacity. Prerequisites: CRP 441, 442, 443. (3-0-3)

CRP 450,Contemporary Environmental Issues
Environmental problems in the context of social, economic, and political trends. Environment as site and source. Role of commercial economies in meeting human needs. Transportation and manufacturing. Competing demands on air, water, and land. Location of environmental problems in time and space. Technological and legal approaches. Governmental and private programs in land use research and planning. Alternative development patterns. (3-0-3)

CRP 463:, 464,Problems and Principles of City and Regional Planning I:, II
Problems of cities and regions. Critical analysis. Elements of cities and regions. The basis of planning. Planning aims and planning process. Development of principles. Investigation and consideration of possibilities. Recent proposals. Problems of development and renewal. Readings, reports, discussions, drawings. Not open to students in Architecture and Planning. (3-0-3); (3-0-3)

CRP 465,The Ecological Basis of Planning
The role of natural systems in meeting human needs. Natural systems. Climate, geology, land forms, soils, vegetation, and animal populations as the bases of agricultural and industrial technologies. Competing demands on air, water, and land. Limiting factors. (3-0-3)

CRP 466,Landscape Planning
The role of land in meeting human needs. Examination of planned landscapes, environmental planning methodologies, and techniques of plan effectuation. Readings, individual reports, and field trips. (3-0-3)

CRP 490,Directed Reading
Prerequisite: Consent of the department. (Credit: Variable; maximum 3 credit hours)

CRP 497,Undergraduate Special Problems
Prerequisite: Consent of the department. (Credit: Variable)

Graduate Courses
The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for descriptions.

CRP 515:, 516,Seminars I and II
CRP 517*, 518 Seminars III and IV

CRP 531 Advanced Housing
CRP 532 Community Development

CIVIL ENGINEERING

Chairman: Dr. David Arditi 228 Alumni Memorial Extension 73540
Professors: Arditi, Guralnick (Perlstein Distinguished Professor), Khisty
Adjunct Professors: Carreira, Gill
Associate Professors: Mohammadi, O'Leary
Adjunct Associate Professors: Bak, Civelek, Longinow, Paintal, Zanbak
Assistant Professors: Budiman, Suen (visiting)
Adjunct Assistant Professor: Domel, Fazio, Mehlenbacher, Stefanis
Faculty Emerti: Chu, Fiesenheiser, Milbradt

Civil engineering is the original of the engineering disciplines. With the increase in population, the growing complexity of industries, and changing urban centers, the civil engineer's task—applying science to the control and utilization of the environment for the total benefit of mankind—represents a challenge unsurpassed in all engineering.

The civil engineer often is confronted with conditions so variable and complex that they cannot be precisely defined by science and mathematics. Therefore, a knowledge of the arts and social sciences, as well as the physical sciences, is essential. In addition, because civil engineering requires overall planning of very large projects whose components involve many other disciplines, it is also necessary to have knowledge of management techniques. The goal of the civil engineering degree program is to provide an education that enables graduates to make far-reaching decisions that draw not only upon technical knowledge but also on integrity and judgment.

In the professional courses, classroom lectures are supplemented by laboratory practice, including the study of materials, concrete, hydraulics, environmental engineering, geotechnical engineering, and surveying. The principal functional areas that are considered subdivisions of civil engineering are structural engineering, transportation engineering, geotechnical engineering, environmental engineering, water resources engineering, and construction management.

The Department of Civil Engineering provides introductory undergraduate education in these six subdisciplines of civil engineering and provides professional specializations in the areas of structural, geotechnical, transportation, civil-environmental, and construction engineering. The department also offers graduate degree programs and conducts research in the areas of structural engineering, geotechnical engineering, transportation engineering, and construction engineering and management. In addition, the department provides undergraduate service courses to the Department of Architecture in the area of structural engineering and through minors in construction management and fire protection and safety engineering.

Students may choose a professional specialization in construction, civil-environmental, geotechnical, structural, or transportation, as described on the following pages, or one of the following minors: Air Force Aerospace Studies, Military Science, Naval Science, and Fire Protection and Safety Engineering (see page 28).

Civil Engineering

Required Core Major Courses	**Credit Hours**
CE 111, 112, 301, 303, 304, 305, 307, 310, 321 (or ENVE 404), 323, 340, 419, 437, 438, 457, 470, and two technical electives	51
Mathematics Requirements	
MATH 151, 152, 251, 252, 331	21
Physics Requirements	
PHYS 103, 104, 203	11
Chemistry Requirements	
CHEM 120 or 124	4

Computer Science Requirement
CS 105 2

Engineering Course Requirements
EE383, EG 105, MECH 201, 202, 203, 305, MAE 205 20

Humanities and Social Sciences Requirements
ENGL 101, 100-level HUM 6

Humanities Electives (300-level and above) **6**
Social Science Electives (6 hrs. 300-level +) 12

Electives
Science Elective (MS 101 or CHEM 126) 3
Total Credit Hours **136**

Curriculum

First

MATH 151	4	2	5
CHEM 124	3	3	4
CE 111	0	2	1
EG 105	1	2	2
ENGL 101*	3	0	3
Social Sciences Elective*	3	0	3
Totals	14	9	18

Second

MATH 152	4	2	5
Science Elect (MS 101 or CHEM 126)	3	0	3
CS 105	2	1	2
CE 112	0	2	1
HUM 100-level course*	3	0	3
PHYS 103	3	0	3
Totals	15	5	17

Third

MATH 251	4	0	4
MECH 201	3	0	3
CE 305	2	2	3
PHYS 104	3	3	4
Social Sciences Elective*	3	0	3
Totals	15	5	17

Fourth

MATH 252	4 0	4	
MECH 202	3	0	3
MECH 203	3	0	3
PHYS 203	3	3	4
Humanities Elective*	3	0	3
Totals	16	3	17

Fifth Semester

MECH 305	3	0	3
CE 301	2	3	3
CE 303	2	3	3
CE 304	3	0	3
CE 340	2	0	2
MATH 331	3	0	3
Totals	15	6	17

Seventh Semester			
CE 437	3	3	4
CE 457	3	0	3
CE 470	2	3	3
Technical Elective	3	0	3
Social Sciences Elective*	3	0	3
Totals	14	6	16
Sixth Semester			
CE 321	3	0	3
or			
ENVE 404	3	0	3
CE 323	2	3	3
CE 307	2	3	3
CE 310	3	0	3
MAE 205	3	0	3
Humanities Elective*	3	0	3
Totals	16	6	18
Eighth Semester			
CE 419	3	0	3
CE 438	3	3	4
EE 383	3	0	3
Technical Elective	3	0	3
Social Sciences Elective**	3	0	3
Totals	15	3	16
Total credit hours			136

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

*Humanities and social sciences components of the General Education Program (see page 19 for details).

**Students who select a specialization will take a technical elective instead.

Professional Specializations
Students who select an area of specializations must take nine credit hours of technical electives. A minimum of six credit hours must be taken from the following technical electives listed under the respective area of specialization. The remaining three credit hours can be any 400-level CE course taken with prior approval of the student's adviser and chairman. Students who do not select an area of specialization must take six credit hours of CE technical electives and may replace CE 437 and 438 by CE technical electives of their choice.

Structural Engineering CE 408-Bridge and Structural Design, CE 420-Introduction to Dynamics of Structures, CE 430-Probability Concepts in Civil Engineering, CE 435-Introduction to the Experimental Analysis of Structures, and CE 442-Finite Elements Methods.

Construction Engineering and Management CE 471-Construction Planning and Scheduling, CE 472-Construction Site Operation, and CE 473-Construction Project Administration.

Geotechnical Engineering CE 321-Engineering Geology, CE 415-Pavement Design, Construction, and Maintenance, CE 442-Finite Element Methods, and CE 486-Soil and Site Improvement.

Transportation Engineering CE 412-Traffic Engineering and Design, CE 415-Pavement Design, Construction, and Maintenance, CE 416-Facility Design of Transportation Systems, CE 417-Railroad Engineering and Design, and CE 473-Construction Project Administration.

Civil-Environmental Engineering ENVE 401-Introduction to Water Resources Engineering, ENVE 480-Solid Waste Engineering, and CE 482-Hydarulic Design of Open Channel Systems.

Course Descriptions

* May only be taken by architecture students; not for civil engineering majors.

CE 111,Computers in Engineering I
Introduction to engineering and software of the PC. Typically will include word processing, spreadsheets, graphics, data communications and database software. (Same as CS 111.) (2-0-1)

CE 112,Computers in Engineering II
A continuation of CE 111. Application of PC software to engineering problems with emphasis on numerical methods and statistical techniques. Prerequisite: CE 111. (Same as CS 112.) (2-0-1)

CE 185*,Statics for Architects
Scalars, vectors, forces, freebody diagrams. Two- and three-dimensional statics of particles and rigid bodies. Moments of forces, couples. Statically equivalent force systems. Centroids; second moments of areas; parallel-axis theorem. Simple trusses; method of joints; method of sections. Beams; shear and bending-moment diagrams. Prerequisite: MATH 121. Corequisite: MATH 122. (3-0-3)

CE 208,Risk Management and Engineering
Pure risk and its effect on engineering, business, and personal life; recognition of risks and their associated loss potential as related to fire, safety, security, and liability. Management and control factors; reduction or elimination of risk by protection systems or transfer to other entities; assumption of risk after recognition. (3-0-3)

CE 285*,Strength of Materials for Architects
Concepts of stress and strain, state of stress and strain at a point, stress-strain relations. Beam theory; review shear and bending-moment diagrams; flexure stress, shear stresses, deflection analysis, reinforced beams, statically indeterminate beams. Buckling of columns. Prerequisite: CE 185. (3-0-3)

CE 301,Hydraulics and Hydrology
Collection and distribution of water. Flow of fluids through orifices, weirs, venturi meters. Laminar and turbulent flow in closed conduits. Open channel flow. Model analysis using the principles of dimensional analysis. Rainfall and runoff. Corequisite: MECH 305. (2-3-3)

CE 303,Structural Design I
Design loads, factors of safety, load and resistance factors for steel and timber structures. Experimental and analytical study of steel and timber materials subjected to various states of stress. Failure theories, yield and post-yield criteria are treated. Fatigue and fracture mechanics phenomena are related to design practice. The design of tension member, beams, and columns in steel and timber. Prerequisite: MECH 203. (2-3-3) (D)

CE 304,Structural Analysis I
The analysis of statically determinate trusses and frames. Determination of internal forces and calculation of deflections. Application of the principle of virtual work and energy methods. Column stability. Prerequisites: MECH 203, MATH 252. (3-0-3)

CE 305,Geodetic Science
Measurement of distances and angles. Theory of errors. Study of leveling, traversing, topographic mapping, route surveying, earthwork computation, photogrammetry, and boundary surveys. Practice in the use of tapes, levels, transits, and photogrammetric equipment. Prerequisites: EG 105, MATH 151. (2-2-3)

CE 307,Structural Design II
Design loads, factor of safety, load and resistance factors for concrete structures. Properties of concrete making materials and the proportioning of concrete mixtures. Experimental and analytical study of plain and reinforced concrete subjected to various states of stress. Failure theories and the ultimate strength of plain and reinforced concrete structural components. The design of beams, columns and slabs in reinforced concrete. Prerequisites: MECH 203, CE 304. (2-3-3) (D)

CE 310,Structural Analysis II
The analysis of statically indeterminate frames. Application of classical methods including superposition, slope deflection, and moment distribution. Introduction to the direct stiffness method and computer analysis of structures. Prerequisites: CE 304, CE 340. (3-0-3)

CE 321,Engineering Geology
Geology and its relationship to civil engineering; minerals; rocks; soil formation; geologic structure; groundwater hydraulics; frost action in soils, landslides, shoreline erosion, bluff instability; earthquakes; airphoto interpretation, soil and rock mechanics in relation to engineering geology; subsurface exploration; dams, reservoirs, tunnels; case-history illustrations. (3-0-3)

CE 323,Soil Mechanics
Physical and mechanical properties of soils; elementary principles of soil identification and testing. Principles of soil permeability and seepage, consolidation, failure theories, earth pressures, and bearing capacity. Laboratory included. Prerequisites: MECH 203, CE 301. (2-3-3)

CE 340,Computer Methods in Civil Engineering
Review of FORTRAN and other high-level languages. Matrix algebra, numerical solutions to simultaneous polynomial equations, integral and differential equations. Microcomputer-based techniques in various civil engineering areas. Civil engineering networks. Numerical methods in computing eigenvalues and eigenvectors. Logical problems. Introduction to expert systems in civil engineering, use of spreadsheets in civil engineering problems. Prerequisites: MATH 252, CS 105. Corequisite: MATH 331. (2-0-2)

CE 350*,Structures I--Analysis and Timber Design
Analytical calculations of stresses in beams, trusses, frames, and arches. Deflection of trusses and frames. Superposition method of indeterminate structural analysis. Design concepts. Design of timber members and connections. Analysis and design projects which include determinate and indeterminate structures. Prerequisite: CE 285. (3-0-3)

CE 351*,Structures II--Design of Steel Structures
Moment-distribution method. Design of compression, tension, and flexural members. Riveted, bolted, and welded connections. Bearing details of beams and columns. Frame design by approximate elastic methods. Prerequisite: CE 350. (3-0-3)

CE 352*,Structures III--Reinforced Concrete Design
Behavior of reinforced concrete. Design of concrete beams, columns, slabs, footings, and frames. Prerequisite: CE 351. (3-0-3)

CE 408,Bridge and Structural Design
Design of modern bridges and other structures of steel and reinforced concrete. Prerequisite: CE 437. (2-3-3) (D)

CE 412,Traffic Engineering Studies and Design
Basic traffic engineering studies including traffic volume, speed, accident, and parking studies. Capacity and analysis for various traffic facilities. Design of traffic control devices. Prerequisite: Senior standing or consent of the instructor. (3-0-3) (D)

CE 415,Pavement Design:, Construction:, and Maintenance
Pavement types, stresses in flexible and rigid pavements, vehicle pavement interaction. Mathematical models for pavement systems, subgrade support, design of flexible and rigid pavements. Construction procedure, drainage considerations, environmental effects. Rehabilitation and maintenance of pavements. Prerequisite: CE 323. (3-3-4)

CE 416,Facility Design of Transportation Systems
Design and analysis of facilities of transportation systems. Integration of select transportation components and their interrelationships. Design of specific facilities: guideways, terminals, and other elements for railroads, airports, and harbors. Prerequisite: Senior standing or consent of the instructor. (3-0-3) (D)

CE 417,Railroad Engineering and Design
History of railroad industry. Train operation, train make-up, and handling. Design and analysis of railroad track structure, track irregularities, and their representation. Vehicle/track interaction and dynamic problems associated with it. Performance of railway vehicles. Prerequisite: Senior standing or consent of the instructor. (3-0-3) (D)

CE 419,Highway Engineering and Design
Highway functions, design controls and criteria, element of design, cross-section elements, local roads and streets, at-grade intersections, grade separation and interchanges, highway capacity analysis, and introduction to pavement management. (3-0-3) (D)

CE 420,Introduction to Dynamics of Structures
Fundamentals of free, forced, and transient vibration of single and multi-degree of freedom structures, including damping of lumped and distributed parameters systems. Time, frequency, and approximate methods of analysis. Application of numerical methods in time and frequency domain. Response spectra, normal modes, coupling and normal coordinates. Prerequisite: CE 310. (3-0-3)

CE 421,Risk Assessment Engineering
Description and concept of risk, relationship between the likelihood of loss and the impact of loss, engineering hazards assessment and risk identification and evaluation using fault tree analysis, failure mode and effect analysis, etc., risk analyses applications with practical statistics. (3-0-3)

CE 422,Sprinklers, Standpipes, Fire Pumps, Special Suppression, and Detection Systems
Review and introduction to fluid dynamics applied to sprinklers, standpipes, fire pumps, and special suppression systems, hydraulic design criteria and procedures for sprinklers requirements, standpipes, fire pumps, special suppression systems, and detection and alarm systems using nationally recognized design (National Fire Protection Association) standards, water supply requirement systems and distributions. Prerequisite: MECH 305. (3-0-3)

CE 424,Introduction to Fire Dynamics
Introduction to fire, physics and chemistry, and mass and heat transfer principles, fire fluid mechanic fundamentals, fundamentals and requirements of the burning of materials (gases, liquids, and solids), fire phenomena in enclosures such as pre-flashover and post-flashover. Prerequisite: MAE 310, MECH 305, or consent of the instructor. (3-0-3)

CE 425,Fire Protection and Life Safety in Building Design
Fundamentals of building design for fire and life safety. Emphasis on a systematic design approach. Basic considerations of building codes, fire loading, fire resistance, exit design, protective systems, and other fire protection systems. For architects and engineers not majoring in fire protection and safety engineering. (3-0-3)

CE 426,Computer Fire Modeling Theory and Applications
Introduction to fire heat transfer processes and fire testing materials; application of a set of quantitative engineering tools (fire models) to construct a description of conditions that occur or might occur during the course of a fire; life and structural impacts from hostile fires in buildings. Prerequisite: CE 424 or consent of instructor. (3-0-3)

CE 430,Probability Concepts in Civil Engineering Design
Introduction to probability, modeling, and identification of nondeterministic problems in civil engineering. Development of stochastic concepts and simulation models and their relevance to design and decision problems in various areas of civil engineering. Prerequisite: MATH 252. (3-0-3) (D)

CE 435,Experimental Analysis of Structures
The analysis of structures (prototypes) with the aid of models constructed from metal, wood, plastics, and other materials. Geometrical, mathematical, demonstration, graphical, direct and indirect models will be treated. Comparisons of experimental results with results from computer models will be made. Similitude and the theory of models will be treated. Individual and group project work will be emphasized. Prerequisites: CE 304, 310; or CE 350, 351. (2-2-3)

CE 437,Steel and Timber Design
Design of steel beams, plate girders, and beam columns. Bolted and welded connections. Design of typical frame systems. Prerequisites: CE 307, 310. (3-3-4) (D)

CE 438,Concrete and Foundation Design
Design of reinforced concrete building frames and continuous structures. Design of girders, slabs, columns, foundations, and retaining walls. Prerequisites: CE 307, 310. (3-3-4) (D)

CE 442,Finite Element Methods in Framed Structures
Basic principles and review of elasticity, energy methods, stiffness method, element stiffness matrix, finite elements applications in frames, trusses, curved and non-prismatic and plate structures, convergence of finite element models, practical problems. Prerequisite: CE 310. (3-0-3)

CE 457,Geotechnical Foundation Design
Methods of subsoil exploration. Study of types and methods of design and construction of foundations for structures, including single and combined footings, mats, piles, caissons, retaining walls, and underpinning. Drainage and stabilization. Prerequisites: CE 301, CE 323. (3-0-3) (D)

CE 470,Construction Methods and Cost Estimating
Construction contract administration. Types of estimates. Unit costs and production rates; job costs. Preparing bid for complete building project using manual methods and the CSI format; checking quantity take-off and cost estimating in selected divisions using a computer package. Prerequisite: Senior standing. (2-3-3) (D)

CE 471,Construction Planning and Scheduling
Planning, scheduling, and progress control of construction operations. Critical Path Method and PERT. Resource leveling of personnel, equipment, and materials. Financial control/hauling of construction projects. Introduction to development and usage of CPM and PERT methodologies. Precedence networks. Construction contract administration. Computer applications. Prerequisites: CE 470 and senior standing. (3-0-3) (D)

CE 472,Construction Site Operation
Construction site layout and mobilization. Liabilities of the parties. Methods of construction. Concrete form design and fabrication. Scaffolding, temporary facilities, and equipment. Safety on sites. Introduction to construction productivity. Prerequisite: Senior standing. (3-0-3)

CE 473,Construction Project Administration
Characteristics of the construction industry. Project delivery systems. Duties and liabilities of the parties at the pre-contract stage. Bidding. Contract administration including duties and liabilities of the parties regarding payments, retainage, substantial and final completion, scheduling and time extensions, change orders, changed conditions, suspension of work, contract termination, and resolution of disputes. Contract bonds. Managing the construction company. Labor law and labor relations. Prerequisite: Senior standing. (3-0-3)

CE 482,Hydraulic Design of Open Channel Systems
Uniform flow design; backwater profiles in natural streams; gradually varied flow practical problems; spatially varied flow; flow through nonprismatic and nonlinear channels; gradually varied unsteady flow; rapidly varied unsteady flow; flood routing; numerical solutions of open channels. Prerequisite: CE 301 or consent of instructor. (3-0-3) (D)

CE 486,Soil and Site Improvement
Theory of water flow through porous media. Site improvement techniques including grading and drainage, dewatering, reinforcement, and slurry trenches. Soil improvement techniques including replacement, in situ compaction, preloading and subsurface drainage, grouting, freezing, prewetting, and heating. Prerequisites: CE 323 or consent of instructor. (3-0-3)

CE 491,Undergraduate Research
Special research problems in civil engineering under individual supervision of instructor. Seminar presentation is required. Prerequisite: Senior standing, minimum GPA of 3.0, and consent of instructor. (Credit: Variable; maximum 4 credit hours)

CE 497,Special Project
Special design project under individual supervision of instructor. Prerequisite: Senior standing, minimum GPA of 3.0, and consent of instructor. (Credit: Variable; maximum 4 credit hours)

Graduate Courses
Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

COMPUTER SCIENCE

Chairman: Dr. C. Robert Carlson236B Stuart BuildingExtension 75150
Professors: Campbell, Evens
Associate Professors: Bauer, Carlson, Christopher, Elrad, Grace, Greene, Kenevan
Assistant Professors: I. Burnstein, Roberge
Adjunct Associate Professors: Hier, Soneru, Wallace
Adjunct Assistant Professor: Goldberg
Instructors: Biardo, Hewitt, Suriano, Wohl

Computer scientists are the agents of change who transformed the Industrial Age into the Age of Information. They changed not only the way we do certain tasks--in the office, the home, the manufacturing plant--but what we do. In the process, a wide variety of problems of an entirely new type have been encountered, and the discipline of computer science has evolved to study and solve these problems. Areas of interest in computer science range from theoretical studies of the nature of computing and efficiency of fundamental computing algorithms, through design and implementation of software and data base systems, to analysis, design, and construction of computing devices.

The student of computer science has the opportunity to become involved with any of a large number of computer applications, or the student may be interested in the more basic study of the computer itself and its related theoretical and practical problems. The computer science curriculum is designed to allow for a broad spectrum of study.

The department offers two undergraduate degree programs: the Bachelor of Science in computer science and the Bachelor of Arts with a concentration in computer science. Both programs provide the student with a solid foundation in the basic study of computer science. Emphasis in the Bachelor of Science program is given to the concepts and techniques necessary for the design and development of advanced computer systems. Students choosing the Bachelor of Arts program are encouraged to explore a wide range of computer applications.

Computer Science--B.S

Required Core Major Courses	**Credit Hours**
CS 113, 114, 200, 330, 331, 350, 351, 430, 440, 450, 487, 493, 494 32	
Electives	18
Mathematics Requirements	
MATH 151, 152, 251 or 252	14
Electives	6
Science Requirements	
PHYS 103, 104	7
Electives	6
Humanities and Social Sciences Requirements	
ENGL 101, 421	6
HUM 100-level	3
HUM electives	6
PHIL 374 or CS 485	3
ECON or MGT	3
Social Science Electives	9
Minor	15
Free electives	6
Total Credit Hours	134

Bachelor of Science Curriculum

First			
CS 113	0	2	1
CS 200	2	2	3
MATH 151	4	2	5

ECON or MGT	3	0	3
ENGL 101	3	0	3
Totals	12	6	15

Third Semester

CS 350	3	0	3
MATH 251 or 252	4	0	4
PHYS 103	3	0	3
HUM elec	3	0	3
Soc. Sci. elec.	3	0	3
Totals	16	0	16

Fifth Semester

CS 440	3	0	3
CS 450	3	0	3
CS elec	3	0	3
MATH elec	3	0	3
Minor	3	0	3
Science elec.	3	0	3
Totals	18	0	18

Second

CS 114	0	2	1
CS 330	3	0	3
CS 331	2	2	3
MATH 152	4	2	5
SS elective	3	0	3
HUM 100-level course	3	0	3
Totals	15	6	18

Fourth Semester

CS 351	2	2	3
HUM elec.	3	0	3
MATH elec.	3	0	3
PHYS 104	3	3	4
MINOR	3	0	3
Totals	14	5	16

Sixth Semester

CS 430	3	0	3
CS 487	3	0	3
CS elec.	3	0	3
ENGL 421	3	0	3
ELECTIVE	3	0	3
Science elec.	3	0	3
Totals	18	0	18

Seventh

CS 493	0	2	1
CS elec.	3	0	3
CS elec.	3	0	3
Free elec.	3	0	3
SS elec	3	0	3
MINOR	3	0	3
Totals	15	2	16

Eighth

CS 494	0	4	2
CS elec.	3	0	3

CS elec.	3	0	3
Free elec.	3	0	3
PHIL 374 or CS485	3	0	3
Minor	3	0	3
Totals	15	4	17
Total Credit Hours			**134**

Bachelor of Arts Concentration in Computer Science

A student who wishes to obtain a broader, more diversified education may also concentrate in computer science through the Bachelor of Arts program. The requirements include the common core of the B.A. program, mathematics courses, computer science courses, a minor, a natural science/engineering component, an interdisciplinary workshop, and elective courses.

Computer Science--B.A

Required CoreCredit	
Major CoursesHours	
CS 113, 114, 200, 330, 331, 350, 351, 430, 440, 450, 487	29
Electives	18
Mathematics Requirements	
Electives	12
Science Requirements	
Electives	12
Humanities and Social Sciences Requirements	
ENGL 101	3
HUM 100-level	3
HUM electives	9
Social Science electives	15
Minor	15
Electives	
Free electives	12
Interdisciplinary course	3
Total Credit Hours	131

Bachelor of Arts Curriculum

First Semester

CS 113	0	2	1
CS 200	2	2	3
ENGL 101	3	0	3
MATH elec.	3	0	3
Soc. Sci. elec.	3	0	3
Science elec.	3	0	3
Totals	14	4	16

Third Semester

CS 330	3	0	3
CS 350	2	2	3
HUM elec.	3	0	3
MATH elec.	3	0	3
Science elec.	3	0	3
Soc. Sci. elec.	3	0	3
Totals	17	2	18

Fifth Semester

CS 440	3	0	3
CS 450	3	0	3
CS elec.	3	0	3

Soc. Sci. elec.	3	0	3
Minor	3	0	3
Free elec.	3	0	3
Totals	18	0	18

Second

CS 114	0	2	1
CS 331	2	2	3
HUM 100-level course	3	0	3
MATH elec	3	0	3
Science elec	3	0	3
Soc. Sci. elec.	3	0	3
Totals	14	4	16

Fourth Semester

CS 351	2	2	3
HUM elec.	3	0	3
MATH elec.	3	0	3
Science elec.	3	0	3
Minor	3	0	3
Totals	14	2	15

Sixth Semester

CS 430	3	0	3
CS 487	3	0	3
HUM elec	3	0	3
Soc Sci elec.	3	0	3
Free elec.	3	0	3
Minor	3	0	3
Totals	18	0	18

Seventh Semester

CS elec.	3	0	3
CS elec	3	0	3
CS elec.	3	0	3
Free elec	3	0	3
Minor	3	0	3
Totals	15	0	15

Eighth Semester

CS elec.	3	0	3
CS elec.	3	0	3
Interdis.	3	0	3
Minor	3	0	3
Free elec.	3	0	3
Totals	15	0	15
Total Credit Hours			131

Optional Programs

Students who plan to combine their computer science degree with an M.B.A. degree should set up an appropriate minor program in consultation with an adviser in the Stuart School of Business. B.S. candidates who plan to earn an M.S. in electrical engineering should see the IIT Bulletin: Graduate Programs for entrance requirements and set up an appropriate minor program in consultation with an adviser in the Department of Electrical and Computer Engineering.

Course Descriptions

CS 103,Computers

An introductory course for nontechnical majors who have had little or no prior experience with computer programming. Algorithms, program design, and documentation. Introduction to analyzing

and construction of solutions to numerical problems using an interactive computer system and personal computers. This course does not count for graduation in any engineering or science degree program. (2-1-2)

CS 105,Introduction to Computing
Designed for students who have had little or no prior experience with computer programming. Algorithms, program design, and documentation. Introduction to analyzing and construction of solutions to numerical and non-numerical problems using an interactive computer system and personal computers. FORTRAN Programming. (2-1-2)

CS 111,Computers in Engineering I
Introduction to engineering and software of the PC. Typically will include word processing, spreadsheets, graphics, data communications, and database software. Engineering students only. (0-2-1)

CS 112,Computers in Engineering II
A continuation of CS 111. Application of PC software to engineering problems with emphasis on numerical methods and statistical techniques. Prerequisite: CS 111 or equivalent. (0-2-1)

CS 113,Computers in Science I
Introduction to the interdisciplinary application of computers. Typically will include word processing, spreadsheets, graphics, data communications, and database software. (0-2-1)

CS 114,Computers in Science II
A continuation of CS 113 with emphasis on areas within computer science. Application of personal computer software to problem analysis and design. Prerequisites: CS 113 or equivalent. (0-2-1)

CS 115,Computers in Business
Introduction to business and PC software. Typically will include word processing, spreadsheets, graphics, data communications, and database software. (0-2-1)

CS 117,Computers in Architecture:, Planning & Design
Introduction to APD and PC software. Typically will include word processing, spreadsheets, graphics, data communications, and database software. (0-2-1)

CS 200,Introduction to Computing II
Structured approach to problem-solving and program design based on a structured programming language. Study of a variety of computer problem-solving techniques with emphasis on choice of basic data structures and algorithms. Prerequisite: CS 105 or consent of instructor. (2-2-3)

CS 325,Data Processing and File Management
Introduction to database systems and file processing techniques. Retrieval, access, and maintenance of sequential and direct files. Data storage and manipulation techniques. Methods of system analysis for and construction of information systems. Introduction to a standard file processing computer language and related exercises. Prerequisite: CS 105. (3-0-3)

CS 330,Discrete Structures
Introduction to formal mathematical structures. Boolean algebra and its application to logic and switching theory. Abstract models of languages and computation. Prerequisite: CS 200. (3-0-3)

CS 331,Data Structures and Algorithms
Implementation and application of the essential data structures used in computer science. Analysis of advanced sorting and searching algorithms and their relationship to these data

structures. Particular emphasis is given to the role of data abstraction in the design and application of data structures. Prerequisite: CS 200. (2-2-3)

CS 350,Computer Organization/ Assembly Language Programming
Provides students with an understanding of the architectural features of computers with examples of micro, mini, and mainframe architectures. Provides insight into the relationships between machine hardware, native instruction set and implementation of high-level languages in a machine. Familiarizes students with the instruction set of a computer through programming assignments. Instructs students in the use of assembly language as a tool for analysis of computer architecture. Prerequisite: CS 200 or consent of instructor. (3-0-3)

CS 351,Systems Programming
Systems of software tools; macroprocessors, loaders, and text editors. Physical I/O and I/O programming. Recursion, interfacing to assembly routines, and interrupt handling. Prerequisites: CS 331, 350. (2-2-3)

CS 387,UNIX/C Programming
Introduction to the C programming language and the UNIX operating system. Focuses on UNIX system tools such as sed, awk grep, lex, yacc, vi, and emacs. Prerequisites: CS 200, 331. (3-0-3)

CS 397,Special Projects
Prerequisite: Written consent of instructor. (Credit: Variable)

CS 411,Computer Graphics
Overview of display devices and applications. Vector graphics in two and three dimensions. Image generation, representation, and manipulation. Homogeneous coordinates. Modeling and hidden line elimination. Introduction to raster graphics. Perspective and parallel projections. Prerequisites: CS 331, 350. (3-0-3)

CS 425,Database Organization
Database architecture. Relational, hierarchical, and network models of data. Query languages and data definition languages. Security and integrity problems. Prerequisite: CS 200 or 325. (3-0-3)

CS 430,Introduction to Algorithms
An introduction to the design, behavior, and analysis of computer algorithms. Searching, sorting, and combinatorial algorithms are emphasized. Worst case and average bounds on time and space usage. Prerequisites: CS 330, 331. (3-0-3)

CS 440,Programming Languages and Translators
Study of commonly used computer programming languages with emphasis on precision of definition and facility in use. Extensive programming work in a variety of languages. Scanning, Parsing, and introduction to compiler design. Use of compiler generating tools. Prerequisites: CS 331, 351, or consent of instructor. (3-0-3)

CS 441,Current Topics in Programming Languages
New topics in programming language design such as concepts of concurrent and distributed programming, communicating sequential processes, and functional programming. System development tools and language features for programming. An introduction to programming language semantics. The language Ada--its use and evaluation with respect to the principles of programming language design--is covered. Corequisite or prerequisite: CS 440. (3-0-3)

CS 450,Operating Systems I
Introduction to operating system concepts: system organization for uniprocessors and multiprocessors, scheduling algorithms, process management, deadlocks, paging and

segmentation, files and protection, process coordination and communication. Prerequisites: CS 331, 350 or EE 242, or consent of instructor. (3-0-3)

CS 455,Data Communications
Introduction to data communication concepts and facilities with emphasis on protocols and interface specifications. There is an emphasis on the lower four layers of the ISO OSI reference model. Prerequisite: CS 450. (3-0-3)

CS 460,Fundamentals of Multimedia
Introduction to techniques in personal computer-based multimedia. Includes desktop publishing, hypermedia text and tutorials, presentation media, animated sequencing, sound, graphics and video, and integrated authoring techniques. Prerequisite: CS 105 or equivalent. (2-2-3)

CS 461,Practicum in Teaching and Training Using Multimedia
Study and practical experience in teaching and training using computer-based multimedia. Introduction to pedagogy and application of instructional methodologies; participation in laboratory sessions. Prerequisite: CS 460. (3-0-3)

CS 470,Computer Architecture I
Introduction to functional elements and structures of digital computers. Detailed study of specific machines at the register transfer level illustrates arithmetic, memory, I/O, and instruction processing. Prerequisites: CS 330, 350. (2-2-3)

CS 471,Computer Architecture II
Further study of the internal design and organization of computer architectures. Various methods of interconnecting devices: bus structures, independent channels, interrupt driven controllers, synchronous and asynchronous devices. Survey of the various microprocessors and microcomputer systems available today. The hardware/ software interfacing and applications of these systems. Hands-on experience and construction of a typical microcomputer system. Prerequisite: CS 470. (2-2-3)

CS 472,Microcomputers
Microprocessors and stored program controllers. Memories. Standard and special interfaces. Hardware design. Software development. Interrupt systems. Hardware and software design tools. System design and troubleshooting. Examples will be emphasized. Same as EE 441. Prerequisites: EE 228 or CS 470, EE 242 or CS 350, and senior standing. (3-3-4)

CS 473,Switching Circuit Theory
Design, synthesis, and analysis of synchronous and asynchronous sequential circuits. Foundations of discrete logic, including set theory, graphs, algebraic structures. Descriptions and capabilities of sequential circuits. Properties of sequential circuits applicable to the design process. Minimization, decomposition, machine structure. Fault detection and hazards. Same as EE 483. Prerequisites: EE 228 or CS 330, and senior standing. (3-0-3) (P)

CS 480,Artificial Intelligence
Styles of programming and software engineering with applications to artificial intelligence and to creation of good programming environments through programming key ingredients of these styles. These include techniques of search, data-driven programming, demons, frames, object-oriented programming, production-rule systems, logic programming, and code that constructs code, including language-extension through macros. Same as EE 480. Prerequisite: CS 331. (3-0-3)

CS 485,Computers and Society
Discussion of the impact of computer technology on present and future society. Historical development of the computer. Social issues raised by cybernetics. Prerequisites: CS 105 and at least junior standing. (3-0-3)

CS 487,Software Engineering
Study of software development methodology and software tools. The software development process including requirements analysis, specification, design (both functional decomposition and object-oriented approaches will be discussed), implementation tools, testing, debugging and maintenance standards. Participation in a team project is required. Each team will produce all life-cycle deliverables. Same as EE 487. Prerequisite: CS 387 or 351 or consent of instructor. (3-0-3)

CS 488,Software Prototyping
The course concentrates on software prototyping. It will also cover case tools, screen design demo tools, testing systems, and a rapid prototyping 4GL language. This is a programming course. A prototyping software development project is assigned. Pre/Corequisite: CS 487. (3-0-3)

CS 491,Undergraduate Research
Prerequisite: Written consent of instructor. (Credit: Variable)

CS 493,Senior Project Design
Practicum in the design of large programming projects. Students work as part of a coordinated team that uses techniques form software engineering to develop a design of a solution to a complex problem. Particular emphasis is given to the relationship between system users and system designers and the need for effective communications between these groups during the design process. A different problem will be assigned each year. Offered fall semester only. Prerequisite: CS 487. (0-2-1)

CS 494 Senior Project
Continuation of CS 493. The design process begun in CS 493 is continued through the prototyping and implementation phases. This course sequence culminates in a system review in which the students present their solution to the assigned problem. Offered spring semester only. Prerequisite: CS 493. (0-4-2)

CS 495,Topics in Computer Science
This course will treat a specific topic, varying from semester to semester, in which there is particular student or staff interest. Prerequisite: Consent of instructor. (Credit: Variable)

Graduate Courses
The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

CS 511,Advanced Topics in Computer Graphics
CS 524 Database Design and Management
CS 525 Advanced Database Organization
CS 530 Formal Theory of Computation
CS 531 Topics in Automata Theory
CS 532 Formal Languages
CS 535 Analysis of Algorithms
CS 536 Science of Programming
CS 540 Syntactic Analysis of Programming Languages
CS 541 Compiler Construction
CS 542 Principles of Computer Networks
CS 543 Advanced Topics in Computer Networks
CS 544 Program Verification
CS 545 Concurrent Programming
CS 546 Parallel Processing
CS 550 Comparative Operating Systems

CS 551 Operating System Design and Implementation
CS 555 Analytic Models and Simulation of Computer Systems
CS 560 Computer Science in the Classroom
CS 561 The Computer and Curriculum Content
CS 565 Computer-Assisted Instruction
CS 566 Practicum in the Application of Computers to Education
CS 570 Comparative Computer Architecture
CS 572 Advanced Computer Architecture
CS 581 Advanced Artificial Intelligence
CS 582 Robotics
CS 583 Expert Systems
CS 584 Neural Networks
CS 585 Natural Language Processing
CS 587 Programming Project Management
CS 588 Software Engineering Project

ELECTRICAL AND COMPUTER ENGINEERING

Chairman: Dr. Henry Stark 136 Siegel Hall Extension 3400
Professors: Arzbaecher, LoCicero, Saeks, Shahidehpour, H. Stark (Carl and Paul Bodine Distinguished Professor)
Research Professor: Camras
Associate Professors: Clarkson, Jaeger (jointly with Pritzker Institute), Kraft(jointly with Stuart School of Business), Saletta, Saniie, Troyk, Ucci, Weber, Wong
Adjunct Professor: Briley
Adjunct Associate Professors: Abramovici, Lidinsky
Assistant Professors: Atkin, Behera, Ben-Arie, Galatsanos, Han, J.L. Larsen, Nestor, Patterson, Williamson
Adjunct Assistant Professor: Borkar
Instructor: Tagliavia
Faculty Emeriti: Armington, Jones, Martin, Peach, Whitehead

Electrical and computer engineering is concerned with generating, transmitting, and utilizing electrical energy and with transmitting and processing information. The first set of activities covers the analysis and design of electric power systems; the second, the design of radio, radar, television, computers, as well as communication, control, and information systems. Electrical and computer engineers have helped solve many of society's most pressing problems and will continue to do so in the future. For example, they have been a prime force in developing automated mass transit systems, computerized traffic control, telecommunication systems, as well as pollution monitoring and abatement systems.

The types of electric components the engineer has to work with have increased dramatically in the past few years. The electrical engineer and the computer engineer can work with something as large as a generator capable of supplying the energy needs of a large city or as small as an integrated circuit a few thousandths of an inch square.

A background in physics, chemistry, mathematics, and computer science is extremely important if students are to keep abreast of new developments in electrical and computer engineering. This is achieved with course offerings in these areas during the first two years of the BSEE program. Included in the second and third years of the BSEE curriculum are basic electrical engineering subjects required of all electrical and computer engineers. Courses in energy conversion, electro-dynamics, digital and computer systems, electronics, and linear systems give the student an opportunity to sample areas in which he or she may wish to specialize.

A substantial portion of the senior year is devoted to professional electrical and computer engineering electives, where engineering design is an integral part of the subjects taught. These courses provide specialized training to further prepare the student for the transition to industry or graduate school.

Students may also choose a professional specialization in computer engineering as described on the following pages or one of the following minors (see section beginning on page 27):

Air Force Aerospace Studies
Applied Solid State Physics
Computer Architecture Management for EE Majors
Military Science
Naval Science
Electrical Engineering

Required Core Major Courses	**Credit Hours**
EE 111, 112, 201, 203, 228, 229, 242, 307, 308, 309, 311, 312, 316, 33138	
Professional Electives	14

Mathematics Requirements
MATH 151, 152, 251, 252, 333, 47524

Physics Requirements

PHYS 103, 104, 203	11

Chemistry Requirement

CHEM 124	4

Computer Science Requirement

CS 105	2

Engineering Course Requirements

EG 105, MECH 200, MAE 205	8

Humanities and Social Sciences Requirements

ENGL 101, 100-level HUM	6
Humanities Electives (300-level and above)	6
Social Science Electives (6 hrs. 300-level)	12
Electives	
Science Elective (MS 101 or CHEM 126)	3
Technical Elective	3
Free Electives	6
Physical Education	0
Total Credit Hours	**137**

Curriculum

First

MATH 151	4	2	5
CHEM 124	3	3	4
EG 105	1	2	2
EE 111	0	2	1
ENGL 101*	3	0	3
Social Sciences Elective	3	0	3
Physical Education Elective	0	2	0
Totals	14	11	18

Third Semester

MATH 252	4	0	4
PHYS 104	3	3	4
EE 201	3	0	3
EE 228	3	0	3
Social Sciences Elective*	3	0	3
Totals	16	3	17

Fifth Semester

MATH 333	3	0	3
MAE 205	3	0	3
EE 307	3	3	4
EE 311	3	3	4
EE 316	0	3	1
Humanities Elective*	3	0	3
Totals	15	9	18

Seventh Semester

Professional EE Electives	6	3	7
MATH 475	3	0	3
Free Elective***	3	0	3
Humanities Elective*	3	0	3
Totals	15	3	16

Second

MATH 152	4	2	5
PHYS 103	3	0	3
Science Elective**	3	0	3
CS 105	2	1	2
EE 112	0	2	1
HUM 100-level course*	3	0	3
Physical Education Elective	0	1	0
Physical Education Elective	0	1	0
Totals	15	7	17
Fourth Semester			
MATH 251	4	0	4
PHYS 203	3	3	4
MECH 200	3	0	3
EE 203	3	0	3
EE 229	0	3	1
EE 242	3	0	3
Totals	16	6	18
Sixth Semester			
EE 308	3	0	3
EE 309	3	0	3
EE 312	3	3	4
EE 331	3	3	4
Social Sciences Elective*	3	0	3
Totals	15	6	17
Eighth Semester			
Professional EE Electives	6	3	7
Technical Elective	3	0	3
Free Elective***	3	0	3
Social Sciences Elective*	3	0	3
Totals	15	3	16
Total credit hours			**137**

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

* Humanities and social sciences components of General Education Program (see page 18 for details).

** Science elective must be CHEM 126 or METM 101

*** Courses from any of the IIT colleges that are more advanced than the admission requirements of the Armour College and are approved by an adviser may be taken for free elective credit.

Students must complete one year of physical education consisting of one sixteen-week swimming course (PE 011–PE 015) and two different eight-week elective courses (PE 021–PE039) unless otherwise waived or satisfied (see page 207).

Professional EE electives may be chosen from any of the 400-level EE courses identified with a P in the course descriptions. Courses at the 500 level may be taken with the consent of the instructor or the department chairman. At least two of the electives must contain laboratories.

Technical electives may be chosen from any of the engineering departments. These courses must be more advanced than the admission requirements of the Armour College and must be approved by an adviser.

NOTE: Elective courses have varying amounts of design content. Professional EE electives with laboratories are taught so as to include considerable design content. To assure that students meet ABET design requirements, all EE majors are required to select a minimum of eight hours of

design in the elective courses. The list of design hours for elective courses is updated periodically and is posted in the ECE department
Professional Specialization

Computer Engineering Curriculum

Required Core Major Courses	**Credit Hours**
EE 111, 112, 201, 203, 228, 229, 242, 307,308, 309, 311, 312, 316, 331, 441, 446, 44849	
Professional Elective	3
Mathematics Requirements	
MATH 151, 152, 251, 252, 333, 4752	4
Physics Requirements	
PHYS 103, 104, 203	11
Chemistry Requirement	
CHEM 1244	
Computer Science Requirement	
CS 105, 200, 331, 450	11
Engineering Course Requirements	
EG 105, MECH 200, MAE 205	8
Humanities and Social Sciences Requirements	
ENGL 101, 100-level HUM	6
Humanities Electives (300-level and above)	**6**
Social Science Electives (3 hrs. 300-level)	9
Electives	
Science Elective (MS 101 or CHEM 126)	3
Free Elective	3
Physical Education	0
Total Credit Hours	137

Fifth			
MATH 333	3	0	3
MAE 205	3	0	3
EE 307	3	3	4
EE 311	3	3	4
EE 316	0	3	1
CS 200	3	0	3
Totals	15	9	18

Seventh Semester			
EE 441	3	3	4
MATH 475	3	0	3
Professional EE Elective	3	0	3
Humanities Elective*	3	0	3
Free Elective**	3	0	3
Totals	15	3	16

Sixth			
EE 308	3	0	3
EE 309	3	0	3
EE 312	3	3	4
CS 331	3	0	3
EE 331	3	3	4

Totals	15	6	17
Eighth Semester			
EE 446	3	3	4
EE 448	3	0	3
CS 450	3	0	3
Social Sciences Elective*	3	0	3
Humanities Elective*	3	0	3
Totals	15	3	16
Total credit hours			**137**

* Humanities and social sciences components of the General Education Program (see page 18 for details).

** Courses from any of the IIT colleges that are more advanced than the admission requirements of the Armour College of Engineering and are approved by an adviser may be taken for free elective credit.

Professional EE elective may be chosen from any of the 400-level EE courses designated with a P in the course descriptions. A course at the 500 level may be taken with the consent of the instructor or the department chairman.

EE 111,Computers in Electrical Engineering I
Introduction to electrical engineering principles and software tools used on the PC. Concepts covered include word processing, spreadsheets, graphics, data communications, and database software. (Same as CS 111.) (0-2-1)

EE 112,Computers in Electrical Engineering II
Continuation of EE 111. Application of an integrated software package on the PC to engineering problems with emphasis on numerical methods and statistical techniques. Prerequisite: EE 111. (Same as CS 112.) (0-2-1)

EE 201,Circuit Analysis I
Ohm's Law, Kirchhoff's Laws, and network element v-i relations. Application of mesh and nodal analysis to circuits. Dependent sources, operational amplifier circuits, superposition, Thevenin's and Norton's Theorems, maximum power transfer theorem. Transient circuit analysis for RC, RL, and RLC circuits. Corequisite: MATH 252. (3-0-3)

EE 203,Circuit Analysis II
Sinusoidal excitation and phasors. AC steady-state circuit analysis using phasors. Complex frequency, network functions, pole-zero analysis, frequency response, and resonance. Transformers, mutual inductance, AC steady-state power, RMS values, introduction to three-phase systems and Fourier series. Prerequisite: EE 201. (3-0-3)

EE 228,Digital Systems
Digital and logical system fundamentals. Number systems, binary codes, and Boolean algebra. Switching devices, discrete and integrated digital circuits, analysis and design of combinational logic circuits, use of Karnaugh maps. Minimization techniques. Counters and registers. Clocked sequential circuits: analysis and design. Prerequisite: Sophomore standing. (3-0-3)

EE 229,Digital Systems Laboratory I
Design oriented laboratory experiments using state-of-the-art digital integrated circuits, including: combinatorial circuits, arithmetic operations using saturation logic, flip-flops, shift-registers, asynchronous and synchronous counters, sequential multiplication. Prerequisite: EE 228 or an equivalent digital systems course. (0-3-1)

EE 242,Digital Computers and Computing
The study of digital computer architecture and programming languages. Assembly language programming and simulation. Comparative study of various computer systems (hardware and software), with an emphasis on microcomputers. Emphasis on the analysis of practical problems and the design of their solutions using basic programming techniques. Prerequisites: CS 105, EE 228. (3-0-3)

EE 243,Computers and Digital Systems
Digital computer and digital system fundamentals. Computer architecture and programming languages. Microcomputers and their applications. Credit for this course is not applicable to a B.S.E.E. or a B.S.C.S. Prerequisite: CS 100 or 105, EE 228. (3-0-3)

EE 307,Electrodynamics
Vector analysis applied to static and time-varying electric and magnetic fields. Coulomb's Law, electric-field intensity, flux density and Gauss's Law. Energy and potential. Biot-Savart and Ampere's Law. Maxwell's equations with applications including uniform-plane wave propagation. Prerequisites: PHYS 203, MATH 251. (3-3-4)

EE 308,Signals and Systems
Time and frequency domain representation of continuous and discrete time signals. Time and frequency domain analysis of linear systems. Fourier series, convolution, transfer functions. Fourier transforms, Laplace transforms, and Z-transforms. An introduction to sampling and discrete time systems. Prerequisites: EE 203, MATH 333. (3-0-3)

EE 309,Traveling Waves
Analysis and design of circuits using distributed network elements. Response of transmission lines with linear and nonlinear loads to digital and transient signals. The Smith Chart as an analysis and design tool. Impedance matching methods; transmission line transformers. Prerequisites: EE 203, 307. (3-0-3)

EE 311,Engineering Electronics
Physical structures of semiconductor devices. Analysis of analog and digital diode circuits. Principles of operation of bipolar and field-effect transistors. Biasing techniques for circuit design. Solid-state amplifier analysis and design using graphical techniques. Linear equivalent circuit analysis of bipolar and field-effect transistors. Prerequisite: EE 203. (3-3-4)

EE 312,Electronic Circuits
Analysis and design of differential and operational amplifiers. Analysis of basic operational amplifier structure. Operational amplifier design and applications (linear and nonlinear circuits). Feedback theory, frequency response of solid-state circuits. Compensation techniques for designing stable feedback amplifiers. Comparators, Schmitt triggers, and voltage time-base generators. Oscillator theory: design and application. Design-oriented laboratory. Prerequisite: EE 311. (3-3-4)

EE 316,EE Laboratory I
Laboratory experiments with linear circuits; analog and digital computer-aided solutions of circuits. Analysis and design of circuits considering non-ideal components. Corequisites: EE 203, 311. (0-3-1)

EE 331,Energy Conversion
Principles of electromechanical energy conversion and its application to develop a unified treatment of electric machinery. Emphasis on engineering considerations applied to transformers, DC and AC machines in the steady state. Laboratory considers operation, analysis, and performance of large and small motors and generators. Prerequisites: EE 203, 307. (3-3-4)

EE 383,Electric and Electronic Circuits
Circuit concepts, Ohm's Law. Kirchhoff's Laws, network theorems. Circuit elements, DC and AC network analysis. Diodes, transistors, and electronic amplifiers. Digital electronics circuits and

instrumentation. Credit for this course not applicable to a B.S.E.E. Prerequisite: PHYS 203 or 207. (3-0-3)

EE 386,Analog and Digital Electronic Circuits
Circuit analysis including Kirchoff's Laws, mesh and node analysis, Thevenin and Norton equivalent circuits. Sinusoidal steady state analysis applied to three phase circuits, power distribution, motors, generators, and transformers. Basic analog electronics: diodes, transistors, and amplifiers, with instrumentation applications. Introduction to digital systems and microprocessors, including arithmetic, logic, and sequential operations. Credit for this course not applicable to a B.S.E.E. Prerequisite: PHYS 203 or 207. (4-0-4)

EE 403,Communication Systems I
Power spectral density. Analysis and design of amplitude and frequency modulation systems. Signal-to-noise ratio analysis. Frequency division multiplexing: spectral

design considerations. The sampling theorem. Analog and digital pulse modulation systems. Time division multiplexing. Design for spectral efficiency and crosstalk control. Introduction to information theory. Prerequisite: EE 308. (3-0-3) (P)

EE 404,Communication Systems II
Lecture portion of EE 406. Credit will be given for either EE 404 or EE 406, but not for both. Prerequisites: MATH 475, EE 403. (3-0-3) (P)

EE 406,Digital and Data Communications
Channel capacity. Digital source encoding: companded and adaptive differential pulse code modulation, adaptive delta modulation. Introduction to linear predictive coding and code excited linear prediction. Design considerations include quantization noise, bit rate reduction, cost, ease of implementation, waveshaping, bandwidth efficiency, and intersymbol interference. Analysis and design of digital modulators as well as synchronous and asynchronous detectors: cost/bandwidth/performance tradeoff. Probability of error analysis. Matched filters. Introduction to statistical communications. Laboratory experiments cover modulation, detection, sampling, analog-to-digital conversion, error detection. Laboratories are system-oriented containing analysis, design, and an open-ended project. Credit will be given for either EE 404 or EE 406, but not for both. Prerequisites: MATH 475, EE 403. (3-3-4) (P)

EE 408,Advanced Electronics
Device modeling with emphasis on the Ebers-Moll model for computer-aided design. Stability of feedback amplifier systems from root locus and Nyquist approaches; oscillators. Theory of phase-locked loops as applied in detectors, modulators, filters, and synthesizers. Project laboratory to confirm paper designs. Prerequisite: EE 312. (3-3-4) (P)

EE 409,Communications Electronics
Radio frequency transmitter and receiver principles. Design of mixers, oscillators, impedance matching networks, filters, phase locked loops, tuned amplifiers, power amplifiers, and crystal circuits. Analysis, design, and testing of AM, FM, and PM systems. Nonlinear effects, intermodulation distortion, and noise. Modulation and demodulation techniques, and RF spectral composition. Transmitter and receiver design specifications. Laboratory experiments cover oscillators, coils, feed-back amplifiers, impedance matching networks, phase locked loops, and spectrum of AM and FM signals,plus an open-ended transceiver design project. Credit will not be given for EE 409 if either EE 416 or EE 417 are taken. Prerequisites: EE 309, EE 312; Corequisite: EE 403. (3-3-4) (P)

EE 410,Topics in Consumer Electronics
Lecture portion of EE 412. Credit will be given for either EE 410 or EE 412, but not for both. Prerequisites: EE 308, 312. (3-0-3) (P)

EE 411,Topics in Power Electronics
Application of electronics to power and control systems. Analysis and design using devices to control power many times their power rating. Use of devices such as power transistors, power MOSFETS, FETS, Thyristors (SCR), triacs, and UJTs for design applications such as control of converters, motor speed control, and switched-mode power supplies. Realization of the switching matrix: AC-DC, AC-AC, DC-AC, and DC-DC converters. Project laboratory that emphasizes power electronic circuit analysis, design of various converters, and design and control of various devices and their cost/ performance tradeoffs. Prerequisites:

EE 312, 331. (3-3-4) (P)

EE 412,Topics in Applied Electronics
Information acquisition and signal processing techniques utilized in communication systems with emphasis on implementation in television. Topics covered include synchronization, surface acoustic wave filters, ultrasonic transducers, frequency band utilization, colorimetry, color encoding and decoding. Laboratory includes design problems. Prerequisites: EE 308, 312. (3-3-4) (P)

EE 413,Modern Optics and Lasers
Geometrical and physical optics. Interference, diffraction, and polarization. Coherence and holography. Light emission and absorption. Principles of laser action, characterization of lasers and laser applications. Same as PHYS 412. Prerequisites: CS 105, PHYS 348 or consent of instructor. (3-0-3)

EE 414,Audio and Electroacoustics
Analysis and design of audio power amplifiers, preamplifiers, passive and active filters. Interpretation of system specifications. Principles of acoustics; characteristics and generation of sound. Basics of magnetic recording. Digital signal processing in audio systems. Project laboratory: the design, construction, troubleshooting, and testing of an audio system with a final evaluation and interpretation of the results. Prerequisite: EE 312. (3-3-4) (P)

EE 415,Solid State Electronics
Energy-bands and carrier transport in semiconductors and metals. Physical principles of p-n junction devices, bipolar junction transistors, FETS, Gunn diodes, IMPATT devices, light-emitting diodes, semiconductor lasers. Same as PHYS 415. Prerequisite: PHYS 348 or consent of instructor. (3-0-3) (P)

EE 416,Telecommunication Electronics
RF receiving system design. Radio frequency spectrum utilization. Transmission system specifications. Noise figure in receivers, intermodulation, and cross-modulation, distortion in mixers and amplifiers. Design of small-signal-tuned amplifiers. LC oscillators, mixers, and detectors. Introduction to impedance matching networks and filter design. Project laboratory: Students will design and build a working receiver. Prerequisite: EE 312 or equivalent. Corequisite: EE 403. (3-3-4) (P)

EE 417,Design of Communications Circuits
RF transmitter system design. Design of tuned power amplifiers, mixers, crystal oscillators, modulators, and detectors. AM, FM, and PM communication circuits are analyzed, designed, and tested. Cost constraints are imposed in the design process. Project laboratory: Students will design and build a working transmitter. Prerequisites: EE 309, 312. Corequisite: EE 403. (3-3-4) (P)

EE 418,Introduction to Lasers
Nature of light. Coherence and holography. Light emission and absorption. Principles of laser action. Characteristics of gas lasers, organic dye lasers, solid state lasers. Laser applications. Same as PHYS 418. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

EE 419,Power Systems Analysis
Characteristics of power systems, three-phase networks and per-unit systems. Transmission systems analysis and design, economic operation of power systems. Design of large-scale power systems using load flow, short circuit, and stability studies. Prerequisites: EE 308, 309. (3-0-3) (P)

EE 420,Analytical Methods in Power Systems
Fundamentals of power systems operation and planning, power system dynamics and control. Design of reliable power systems, power systems security analysis, optimal scheduling of power generation, estimation of power system state. Prerequisites: EE 308, 309. (3-0-3) (P)

EE 421,Microwaves
Lecture portion of EE 423. Credit will be given for either EE 421 or EE 423, but not both. Prerequisites: EE 307, 309. (3-0-3) (P)

EE 423,Microwave Circuits and Systems
Maxwell's equations, waves in free space, metallic and dielectric waveguides, microwave cavity resonators and components, ultrahigh frequency generation and amplification. Analysis and design of microwave circuits and systems. Credit will be given for either EE 421 or EE 423, but not both. Prerequisites: EE 307, 309. (3-3-4) (P)

EE 426,Linear Integrated Circuits
Fabrication of thin-film, thick-film, and monolithic integrated circuits, including

crystal and epitaxial layer growth, oxidation of silicon, solid state diffusion, and ion implantation. Design procedures for integrated-circuit building blocks. Applications employing contemporary linear integrated circuits. Prerequisite: EE 312. (3-0-3) (P)

EE 427,Digital Integrated Circuits
Analysis and design of input and output circuits for various logic families and their relation to specifications and interfacing techniques. Speed, fanout, noise immunity, and temperature dependence. The study of semiconductor memories, MSI, LSI circuits and applications. Prerequisites: EE 228, 312. (3-0-3) (P)

EE 431,Advanced Analysis of Electrical Machinery
Investigation, with experimental support, of fundamental characteristics and physical phenomena of magnetic circuits and transformers, and of motors and generators, including dynamic behavior. Prerequisite: EE 331. (3-3-4) (P)

EE 433,Real-Time Data Acquisition and Processing
A design oriented course stressing real-time applications of signal and system theory, computers, instrumentation, and control. Analog and digital signals, transducers, signal conditioning, analog-to-digital and digital-to-analog conversion, real-time signal processing, control algorithms, and actuators. The laboratory considers design problems from various fields such as biomedical engineering, process control, and motor control. Prerequisites: EE 308, EE 316. (3-3-4) (P)

EE 434,Classical Feedback Control System Analysis and Design:, with Laboratory Experimentation
Mathematical modeling of physical components and systems. Signal flow graphs and block diagrams. Feedback control and types of feedback. Steady state tracking error. Stability and Routh-Hurwitz criterion. Transient response, and time domain compensation design via root locus methods. Frequency domain analysis and design using Bode, Nyquist, and Nichols methods. Introduction to state variable descriptions. The laboratory portion consists of the complete design of a control system, with major tasks being system modeling, experimental verification of the model, controller design, and control system performance testing. Credit will be given for either EE 434 or EE 438, but not for both. Prerequisite: EE 308. (3-0-3) (P)

EE 435,Electrical:, Magnetic:, and Optical Properties of Materials
Electronic structure of solids. Semiconductor devices and their fabrication. Ferroelectric and piezoelectric materials. Magnetic properties, magnetocrystalline anisotropy, magnetic materials and devices. Optical properties and their applications; generation and use of polarized light. Same as METM 435. Prerequisite: EE 311 or METM 318. (3-0-3) (P)

EE 436, Analysis and Processing of Discrete Signals
Discrete-time system analysis, discrete convolution and correlation, Z-transforms. Realization and frequency response of discrete-time systems, properties of analog filters, IIR filter design, FIR filter design. Discrete Fourier Transforms. Applications of digital signal processing. Credit will be given for either EE 436 or EE 437, but not for both. Prerequisite: EE 308. (3-3-4) (P)

EE 437,Digital Signal Processing I
Lecture portion of EE 436. Credit will be given for either EE 436 or EE 437, but not for both. Prerequisite: EE 308. (3-0-3) (P)

EE 438,Classical Feedback Control System Analysis and Design
Lecture portion of EE 434; credit will be given for either EE 438 or EE 434, but not for both. Prerequisite: EE 308. (3-0-3) (P)

EE 439,Introduction to Modern Control Systems
Aspects of state space, discrete digital control, nonlinear control, and nonlinear stability analysis (Liapunov-type, Popov-type). A thorough introduction to optimal control, observer theory, stochastic control, and adaptive control. Prerequisite: EE 438 or consent of instructor. (3-0-3) (P)

EE 441,Microcomputers
Microprocessors and stored program controllers. Memories. Standard and special interfaces. Hardware design. Software development. Interrupt systems. Hardware and software design tools. System design and trouble-shooting. Emphasis on examples. Same as CS 472. Prerequisites: EE 228 or CS 470, EE 242 or CS 350, and senior standing. (3-3-4) (P)

EE 446,Logic Design and Implementation
Design and implementation of digital systems using conservative design practices. Review of combinational and sequential logic with an emphasis on timing and electrical considerations. Sequential logic design using Algorithmic State Machines. Survey of current technology for digital design including modern logic families, programmable logic devices, and semicustom integrated circuits. Introduction to computer processor design including microprogrammed implementation. Design-oriented laboratory. Prerequisites: EE 228, 229, 311, and senior standing. (3-3-4) (P)

EE 448,Mini/Micro Computer Programming
Structured/modular programming techniques in assembly and high-level languages. I/O programming. Software tools. Macro processing. Language interfacing. Emphasis on C language and programming in a UNIX environment. Software design projects. Prerequisites: CS 200, EE 242 or CS 350, and senior standing or consent of instructor. (3-0-3) (P)

EE 449,Object-Oriented Programming and Computer Simulation
Basic concepts in object-oriented programming, such as class, abstraction, inheritance, and polymorphism. Object-oriented programming using C. Main concepts and approaches in computer simulations. Applications of object-oriented programming to event-driven simulations for various fields. Prerequisite: EE 448 or equivalent. (3-0-3) (P)

EE 470,Photonics
An engineering-oriented treatment of optics and photonics, concentrating on optical design for communications and sensor systems. Topics include electromagnetic theory of optics and its

application to free-space and guided-wave optical systems; polarization states; optical components; fiber and integrated-optic waveguides; lasers and semiconductor sources and detectors; electro-optic and acousto-optic modulation techniques. Prerequisites: EE 307, EE 309, or equivalent. (3-0-3) (P)

EE 480,Artificial Intelligence
Styles of programming and software engineering with applications to artificial intelligence and to creation of good programming environments through programming key ingredients of these styles. These include techniques of search, data-driven programming, demons, frames, object-oriented programming, production-rule systems, logic programming, and code that constructs code, including language extension through macros. Same as CS 480. Prerequisite: CS 331. (3-0-3)

EE 481,Image Processing
Introduction to video and imaging systems. Application of communication theory, visual models, and probability theory in the design and synthesis of algorithms for image enhancement. Introduction to data compression; application in the design and synthesis of image-compression algorithms. Introduction to image recognition, understanding, and interpretation. Prerequisites: EE 242, 308, MATH 475, or consent of instructor. (3-0-3) (P)

EE 483,Switching Circuit Theory
Design, synthesis, and analysis of synchronous and asynchronous sequential circuits. Foundations of discrete logic, including set theory, graphs, algebraic structures. Descriptions and capabilities of sequential circuits. Properties of sequential circuits applicable to the design process. Minimization, decomposition, machine structure. Fault detection and hazards. Same as CS 473. Prerequisites: EE 228 or CS 330, and senior standing. (3-0-3) (P)

EE 487,Software Engineering
Study of software design methodology and software tools. The software development process including requirements analysis, specifications, implementation tools, testing, verification, validation, and maintenance standards. Participation in a group project with written and oral reports will be required of each student. Same as CS 487. Prerequisites: CS 387 or CS 440 or consent of instructor. (3-0-3)

EE 491,Undergraduate Research
Independent work on a research project supervised by a faculty member of the department. Prerequisites: Written consents of academic adviser and instructor. (Credit: 1-3 credit hours) (P)

EE 497,Special Problems
Design, development, analysis of advanced systems, circuits, or problems as defined by a faculty member of the department. Prerequisites: Written consents of academic adviser and instructor. (Credit: 1-3 credit hours) (P)

Graduate Courses
The following graduate courses are available to qualified degree-seeking undergraduate students with the approval of the course instructor, faculty adviser, and department chairman. Generally a 3.0/4.0 GPA is required for departmental approval. See the current IIT Bulletin: Graduate Programs for course descriptions.

EE 502,Basic Network Theory
EE 509 Electromagnetic Field Theory
EE 510 Passive Network Synthesis
EE 511 Analysis of Random Signals
EE 521 Quantum Electronics
EE 522 Principles of Electromagnetic Compatibility
EE 523 Advanced Electronic Circuit Theory

EE 526 Active Network Analysis
EE 530 VLSI Design
EE 531 Linear System Theory
EE 535 Discrete Time Systems
EE 545 Computer Communication Networks
EE 546 Mini/Microcomputer Hardware Design
EE 556 Advanced Power System Analysis
EE 558 Power System Reliability
EE 565 Multi-dimensional Signal Processing
EE 569 Digital Signal Processing II
EE 575 Electron Devices
EE 578 Microwaves I

ENGINEERING GRAPHICS

Chairman:Mr. John T. Dygdon 405 Main Building Extension 73365
Professor:Dygdon
Instructors:Briggs, Rybicki
Faculty Emeriti:Hill, Hrachovsky, Loving

Engineering graphics is an indispensable communication and design tool which is concerned with the graphical representation of designs and specifications for physical objects and data relationships as used in engineering, science, and technical work. The graphic language, with the symbolic and verbal languages, enables those engaged in technology to communicate effectively, making it possible for new ideas, designs, and developments to be transformed into useful consumer products. With the increase in technological development, the well-trained engineer, scientist, or technician must be able to make correct graphical representations of engineering structures, designs, and data relationships, and possess an ability to express ideas quickly and accurately through the use of the graphic language.

The Engineering Graphics Department occupies the entire fourth floor of the Main Building and contains traditional drafting laboratories and fully equipped PC-CAD laboratories.

Optional Programs

Recognizing the need for drafters and designers with a strong background in special areas of graphics, the Department of Engineering Graphics offers the following certificate programs. These programs are designed to prepare specialists in graphics for positions in business and industry. Students completing the specified courses with satisfactory grades will be awarded a Certificate of Completion.

Architectural Technology

EG 105Engineering Graphics and Design (1-2-2)
EG 308Architectural Drawing I (2-2-3)
EG 309Architectural Drawing II (2-2-3)
EG 310Architectural Drawing III (2-2-3)
EG 312Architectural Freehand Drawing (2-2-3)
EG 313Architectural Detailing (2-2-3)

Engineering Graphics and CAD
EG 105Engineering Graphics and Design (1-2-2)
EG 305Advanced Engineering Graphics and Design(2-2-3)
EG 306Engineering Descriptive Geometry (2-2-3)
EG 405Mechanical Design Graphics (2-2-3)
EG 406Technical and Pictorial Illustration(2-2-3)
EG 419Computer Graphics in Engineering (2-2-3)

Professional Specialization Courses

The department offers a comprehensive series of special courses that a student may take as electives in areas related to his or her professional goals. Consult the department for advice on appropriate courses.

Course Descriptions

EG 100,Basic Technical Drawing
Designed for students who are not prepared to take EG 105 because they have had little or no high school technical drawing or who need a slower approach to the subject. Special emphasis is placed upon the use of instruments, lettering, line technique, and introductory multiview projection. (0-4-1)

EG 105,Engineering Graphics and Design
Basic traditional and computer-based techniques and applications, multiview sketching, orthographic projection, isometric and oblique pictorials, sectioning, auxiliary views, principles of

descriptive geometry, dimensioning, detail drawings, introduction to design and computer-aided drafting and design (CAD). Prerequisites: Trigonometry. (1-2-2)

EG 204,Blueprint Reading for Machine Industries
Industrial prints, views of objects, analysis of edges and surfaces, sectional views, auxiliary views, screw threads and fasteners, dimensioning, shop processes, first-angle drawing, R.H. and L.H. drawings, and welding representation. (1-3-2)

EG 224,Blueprint Reading for Building Trades
Analysis of building construction drawings and details, dimensioning, shop processes, use of symbols and conventions, material takeoff, and elementary estimating. (1-3-2)

EG 225,Engineering Graphics for Non -Engineers
Designed for students in business, liberal arts and non-technical programs. Basic drafting techniques and applications, lettering, geometric constructions, charts and graphs, technical sketching, multiview projection, pictorial drawings, dimensioning, blueprint reading and working drawings. Introduction to computer graphics. Credit for this course is not applicable to an engineering degree. (2-1-3)

EG 305,Advanced Engineering Graphics and Design
Advanced study of auxiliary views and sectioning, gears and cams, threads and fasteners, working drawings, assembly drawings, and computer-aided drafting and design. Engineering design project. Prerequisite: EG 105. (2-2-3)

EG 306,Engineering Descriptive Geometry
Graphic solutions of problems involving point, line, and plane relationships by auxiliary views and revolutions. Developments and intersections of surfaces. Parallelism and perpendicularity, vectors, mining and civil engineering problems. Shades and shadows, conics, map projection and spherical triangles. Emphasis on those applications which promote visualization and introduce new engineering experience. Applications of computers to problem solving. Prerequisite: EG 105. (2-2-3)

EG 308,Architectural Drawing I
Elements of architectural drafting. Lettering, symbols, plan layout, elementary design in basic materials. Standard details of windows, doors, floors, roofs, stairs, framing. Perspective sketching. Prerequisite: EG 105 or consent of instructor. (2-2-3)

EG 309,Architectural Drawing II
A continuation of EG 308, with more complicated layout problems of residential, small commercial, and industrial buildings. Detailed study of functions of the building. Methods of construction and use of materials and simple perspectives. Prerequisite: EG 308. (1-2-3)

EG 310,Architectural Drawing III
Individual problems assigned to each student; each project developed from schematic plan through all stages of design, including sketches, working drawings, and presentation drawings; perspective drawing with rendering in all media. Prerequisite: EG 309. (2-2-3)

EG 312,Architectural Freehand Drawing
Accurate and rapid sketching, with special emphasis on architectural forms, proportions, perspective; pencil, crayon, chalk, and brush techniques; simple composition problems. Prerequisite: EG 105 or consent of instructor. (2-2-3)

EG 313,Architectural Detailing
Comprises design and drawing and the fitting together of various materials used in erecting and finishing contemporary and traditional buildings. Prerequisite: EG 309 or consent of instructor. (2-2-3)

EG 325,Advanced Engineering Graphics for Non -Engineers
Continuation of EG 225. Threads and fasteners, sectioning and auxiliary views, limit dimensioning, detail and assembly drawings, data representation, principles of descriptive geometry, manufacturing processes and computer graphics/CAD. Credit for this course is not applicable to an engineering degree. Prerequisite: EG 225. (2-1-3)

EG 405,Mechanical Design Graphics
Basic concepts of mechanical design and analysis. Advanced design layouts, details, assemblies, tolerance systems, surface finish control, materials, processes, ANSI drafting standards, engineering data processing systems and procedures, application of computers to design. CAD/CAM. Prerequisite: EG 305. (2-2-3)

EG 406,Technical and Pictorial Illustration
Theory and construction of parallel and perspective pictorial projections, axonometric and oblique projections, parallel and angular perspective. Exploded pictorial assemblies. Basic rendering techniques used in technical illustration. Introduction to computergenerated pictorials. Prerequisite: EG 105. (2-2-3)

EG 409,Computer Generated Pictorial Projections
Study of computer-generated representations of three dimensional objects. Projections include multiview, perspective, axonometric and oblique. Prerequisites: EG 406. (2-2-3)

EG 419,Computer Graphics in Engineering
Techniques of computer-aided design and computer-aided manufacturing. Study of various computer graphic hardware and software systems through demonstrations and use. Prerequisites: EG 105 and junior standing or consent of instructor. (2-2-3)

EG 425,Computer Graphics for Non -Engineers
Principles and applications of computer graphics in business and nontechnical fields. Study of computer graphics hardware and software systems. Use of computer in producing charts, graphs, and technical drawings. Use of PGCAD in problem solving and design. Credit for this course is not applicable to an engineering degree. Prerequisite: EG 325. (2-1-3)

Pritzker Department of Environmental Engineering
Chairman:Dr. Kenneth E. Noll103 Alumni MemorialExtension 73535
Professors:Moschandreas, Noll
Associate Professor:Anderson
Assistant Professors:Cha, Chang, Holsen, Khalili (visiting)
Research Professor:Paulson

Environmental engineering is the controlled use and preservation of the environment. It includes supplying community water, protecting natural waters and the atmosphere from pollution, and pollution abatement. Environmental engineers and scientists are involved in resource development, allocation of use, and management of resources to achieve and maintain the qualities required for designated uses. Environmental specialists deal with solid and hazardous wastes and municipal refuse. They are concerned with the protection of workers in unfavorable industrial environments and with the public's health in urban and rural areas. Environmental engineers and scientists deal with interactions between human beings and their environment, to guard each from the harmful effects of the other.

The Pritzker Department of Environmental Engineering offers programs of graduate study for the Master of Science and Doctor of Philosophy degrees. Selected undergraduate courses, listed in

this Bulletin, are provided in support of those graduate programs and are also available to undergraduate students. Undergraduate environmental engineering minors are available to students in chemical and civil engineering.

Course Descriptions

ENVE 310,Introduction to Environmental Engineering
Principles and applications of environmental processes. Topics include environmental resource management, air and water quality indices, and pollutant sources, effects, and controls. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 401,Introduction to Water Resources Engineering
Principles of hydraulics and water demand projections as used in the design of reservoirs, water distribution systems, and storm and sanitary sewers; aspects of water resource management and environmental engineering economics. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 404,Water and Wastewater Engineering
Principles and applications of physical, chemical, and biological processes for water and waste purification. Evaluation and development of standard and advanced processes relative to pollutant characteristics. Design of engineering treatment systems to meet water quality and effluent standards. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 410,Environmental Health Engineering
Analysis of environmental health problems at the community level, with emphasis on the function of environmental engineering in their control. Course content includes the study of communicable diseases and evolution of the effects of air, water, and noise pollution, solid wastes, and ionizing radiation. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 450,Analysis of Environmental Systems
Principles and procedures required for analysis of data from experimental, pilot, and full-scale environmental systems. Includes applications of statistical and other mathematical techniques in the design and evaluation of complex systems, and in the interpretation of environmental phenomena. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 463,Introduction to Air Pollution Control
Air pollution sources and characteristics of source emissions, atmospheric reactions, effects of pollutants, and techniques of emission control; legal and administrative aspects of air pollution control. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 476,Engineering Control of Industrial Hazards
Design of control systems to enhance occupational safety and health is becoming a basic necessity in most industries. This course is directed toward the vast majority of engineers concerned with design and operation who are not trained to recognize or control existing or potential safety and health hazards. The course will emphasize state-of-the-art quantitative design. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

ENVE 480,Solid Waste Engineering
Quantities and characteristics of solid, hazardous, and municipal waste. Collection methods, equipment, and costs. Refuse disposal practices. Regional planning and management. Prerequisite: CHEM 125, MATH 152, or consent of instructor. (3-0-3)

Graduate Courses
Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

FOOD SAFETY AND TECHNOLOGY

Academic Coordinator: Ms. Isabel D. Wolf Moffett Campus (708) 563-1576
Program in Food Safety and Technology

The National Center for Food Safety and Technology (NCFST) is located at the IIT Moffett Campus, 6502 South Archer Ave., in Bedford Park, Ill. Undergraduate students may earn a certificate of proficiency in Food Safety and Technology upon the successful completion of six of the courses described below. Students interested in this option need to confer with both their academic department advisers and the academic coordinator at the NCFST.

Course Descriptions

FST 401, Biotechnology and Food Safety
Applications of biotechnology and genetic engineering to the food industry including the use of genetically modified microorganisms in fermentations and the production of flavors, colors, and processing enzymes. Food safety and hazard analysis; legal aspects of new foods production. Prerequisite: Biochemistry. (3 0-3)

FST 402, Food Safety and Quality Assurance Systems
Basis of food quality assurance systems and applications to food systems. Statistical quality control methods. Hazard analysis systems. Applications of computers. Prerequisites: Microbiology, Chemistry, Statistics. (3 0-3)

FST 403, Food Safety and New Food Processing Technologies
Importance of processing, traditional safeguards for low-acid canned foods and milk, challenges of new technologies, evaluation of the new technologies from a food safety viewpoint. (3 0-3)

FST 404, Food Packaging Safety
Material usage in food packaging, interactions of packages and foods, the packaging process, new technologies, package integrity, recycling of food packages. (3 0-3)

FST 421, Microbiological Food Safety
An in-depth examination of the significant food-borne pathogens, including both traditional and emerging pathogens that present safety problems to the contemporary food supply. Emphasis will be placed on detection, enumeration, and development of systems to control these food-borne pathogens in food processing and packaging systems. Regulatory, legal, and public health aspects of microbiological food safety will be included. Prerequisite: General Microbiology. (3 0-3)

FST 475, Food Engineering I
Fundamentals of food engineering. Theory and practice in food processing operations including material and energy balances, flow of fluid foods, heat transfer, thermal process evaluation, and evaporation. Problem-solving and calculation sessions. (3 0-3)

FST 476, Food Engineering II
Companion course to FST 475 and normally follows it. Covers freezing and thawing, dehydration (including freeze-drying), distillation, and extraction. (3 0-3)

FST 484, Topics in Food Chemistry
Symposium on current topics in Food Chemistry. New developments in the basic chemistry of lipids, proteins, and carbohydrates and in areas like flavors, pigments, preservatives, and nutritional and functional additives. Review of recent development of analytical instrumentation used in the analysis of foods and food components. Emphasis on problem solving. Prerequisites: CHEM 237 and BIOL 403. (3 0-3)

HUMANITIES

Chairman:Dr. John D. Root 106 Life Sciences Extension 73465
Professors:Ladenson, Root
Associate Professors:Applebaum, Barrett, Feinberg, Harrington, Irving, Schmaus, Snapper
Assistant Professors:Amato, Basu, Bergmann, Fox-Good, Misa
Instructor:Dabbert
Faculty Emeriti:Brouse, Davis, Knepler, Ritter, Sawyier, Zesmer

The Department of Humanities offers a variety of courses and programs in English, foreign languages, history, and philosophy. The department has three objectives:

1. To offer the Bachelor of Arts program with concentrations in a number of specific fields.

2. To strengthen the ability of all students at IIT to formulate and express ideas. (This objective is reached through various writing programs and courses in literature, languages, history, and philosophy.)

3. To help all IIT students enrich their professional and personal lives. (This is achieved through the department's electives, which provide an appreciation and understanding of human development and the moral foundations of human experience, particularly as reflected in history, literature, and philosophy.)

The undergraduate degree programs offered within the humanities department are excellent preparations for careers in law, education, government, and other professional fields.

Major Programs in English
The Bachelor of Arts degree programs are designed to provide a wide range of writing experience--from elementary composition to creative and technical writing-and a capacity to appreciate the place of the creative imagination in the development of Western culture. These form a firm foundation for careers in fields as varied as business, law, government, or teaching.

B.A. Concentration in Literature
This program consists of 33 credit hours in English courses. It should include:

ENGL 301--Introduction to Linguistics
ENGL 337--Shakespeare I
ENGL 338--Shakespeare II
ENGL 351--American Literature Before 1900

The program must also include four courses chosen from:
ENGL 371--Religion and the Tradition of Romance
ENGL 372--Science, Reason, and Imagination in English Literature
ENGL 373--The Romantic Rebellion and Its Aftermath
ENGL 374--Twentieth Century British Literature
ENGL 401--Advanced Composition and Prose Analysis
B.A. Concentration in Communications

This program consists of 33 credit hours in English. It includes the following:
ENGL 421--Technical Writing
ENGL 423--Communication for Management
ENGL 425--Writing Workshops
ENGL 427--Verbal and Visual Communication
ENGL 485--Internship Program
ID 101--Basic Two-Dimensional Design

The program also includes three courses chosen from:
ENGL 332--Rhetoric of Technology
ENGL 335--Intercultural Communication
ENGL 429--Technical Editing
ENGL 435--Organizational Communication

History
History is concerned with the human condition. It deals with continuity and change in the material conditions, institutions, and ideas of different societies. The study of history can help the student toward a better understanding of the complexities of our society, as well as provide a solid foundation for work in government, law, education, urban planning, or management.

B.A. Concentration in History
A major program for the Bachelor of Arts degree with a concentration in history consists of 33 credit hours in history courses, including at least 12 hours in European and 12 hours in American history. It must also include HIST 491-Independent Reading and Research and one of the following:

HIST 494--Senior Seminar in European History
HIST 495--Senior Seminar in American History
HIST 496--Senior Seminar in Urban History
HIST 497--Senior Seminar in History of Science and Technology

Philosophy
Philosophy is the discipline that critically examines the concepts and underlying principles of the natural and social sciences and ethical, aesthetic, and political judgments. Through an appropriate selection of courses, students in various disciplines can obtain a better understanding of the conceptual foundations of their work and gain insight into the fundamental ideas of Western thought.

The Department of Humanities offers an undergraduate program leading to the Bachelor of Arts degree with a concentration in philosophy. This program prepares students for graduate work leading to careers in college or teaching, journalism, law, or in any professional or nonprofessional enterprise in which the ability to reason carefully and critically is essential.

B.A. Concentration in Philosophy
A major program consists of a minimum of 33 credit hours in philosophy courses. It must include:

PHIL 301--Ancient Philosophy
PHIL 302--Origins of Modern Philosophy
PHIL 305--20th Century Philosophy
PHIL 340--Symbolic Logic

One 400-level course of advanced independent study.
Optional Program

The department offers a Certificate Program in Technical and Professional Communications designed for post-baccalaureate students interested in pursuing careers as technical communicators in industry, service institutions (e.g. hospitals), or government. The program requires 17 credit hours of coursework plus an internship for which one credit hour is given. The program includes ENGL 421, ENGL 423, ENGL 427, ID 101, CS 105, and two additional courses to be selected in consultation with the student's adviser.

(H) identifies courses that may be taken to fulfill the Humanities General Education Requirements.

Course Descriptions Art and Architectural History
* May not be used by architecture majors to fulfill Humanities General Education requirements.

NOTE: All art and architectural history courses numbered above 300 require as prerequisites the satisfaction of the Basic Writing Requirement (usually completion of ENGL 101) and a HUM 100-level course.

***AAH 219, 220,History of Architecture I, II**
Comprehensive background as well as concentration on individual cultures and their architects from ancient to modern times. Emphasis on the West, but some discussion of architecture of other cultures. Specific details and expressions of more generalized theories and strategies will be explored. (2-0-2); (2-0-2) (H)

AAH 301,Thinking About Art
A course designed for those who find art pleasing, meaningful, or significant and who want to extend the range of their sensibilities. Theories of art will be studied for insight, as well as for historical interest and continuity. Works of art will be studied for their intrinsic value, for their relation to ideas and events, and as cultural artifacts. Regular visits to area museums and galleries will be required. (3-0-3) (H)

AAH 491,Independent Reading and Research
For advanced students. Prerequisite: Consent of the department. (Credit: Variable) (H)

AAH 494,Senior Seminar: Theories of Architecture in Historical Perspective
An investigation of the development of formal architectural theory in the West. Writings by architects from Vitruvius to the present will be studied, analyzed, and criticized. The relation between theory and practice will be emphasized. The implications of particular theories for such other questions as tradition, change, innovation, revolution, and meaning will be considered. Prerequisites: AAH 219, 220, and ARCH 319, 320, or consent of instructor. (3-0-3) (H)

English
NOTE: All English courses numbered above 300 require as prerequisites satisfaction of the Basic Writing Proficiency requirement (usually by completion of ENGL 101) and a HUM 100-level course.

ENGL 101,Techniques of Prose Writing
A course that offers an introduction to college-level writing, including intensive practice in prose forms, rhetorical principles, and clear style. (3-0-3) (H)

ENGL 105,Intensive Composition
Equivalent to ENGL 101, this course demands two additional hours each week of practice in a writing laboratory. For students whose placement tests indicate a need for additional work. (2-3-3) (H)

ENGL 110,English Structure in Academic Prose
ENGL 110 and ENGL 111 comprise a one year sequence for students whose native language is not English. ENGL 110 helps students with the complex structure and vocabulary of academic writing, with an emphasis on short compositions. (3-0-3)

ENGL 111,Techniques of Prose Writing for Non -Native Students
Equivalent to ENGL 101. Designed to deal with the special writing problems of those students whose native language is not English. (3-0-3) (H)

ENGL 301,Introduction to Linguistics
The objective analysis of language structure and structural hierarchies; a survey of the basic concepts of linguistics; the phoneme, the morpheme, language change over time and space. (3-0-3) (H)

ENGL 305,Aspects of the American English Language
Beginning with a survey of the development of the English language and its place in the world's languages, the course examines the structure of contemporary standard American English from a linguistic perspective and develops the concepts and vocabulary briefly to examine existing geographic and socio-economic variation. (3-0-3) (H)

ENGL 332,Rhetoric of Technology
A literary examination of reports and articles about technology. The course analyzes assumptions about technical progress and the relation between experts and nonexperts, through a study of style, arrangement, selection and omission of contents, genre conventions, and the social and political dynamics of writing in technology. (3-0-3) (H)

ENGL 334,Literature of Modern Science
A study of the literature of science from the Renaissance to modern times. (3-0-3) (H)

ENGL 335,Intercultural Communication
An introduction to the problems of communication across cultures, with emphasis on the interplay of American civilization with those of other cultural areas. (3-0-3) (H)

ENGL 337,Shakespeare I
Analysis of Shakespeare's dramatic and nondramatic works before 1600; histories, comedies, and tragedies through Hamlet. (3-0-3) (H)

ENGL 338,Shakespeare II
Analysis of the later plays, ``problem'' plays, major tragedies, and romances. May be taken independently of ENGL 337. (3-0-3) (H)

ENGL 339,The Short Story
Development of the short story as a literary form from the early masters to such major modern writers in the genre as de Maupassant, Chekhov, Mann, Joyce, and Hemingway. (3-0-3) (H)

ENGL 340,World Drama
Study of the major dramatists of Western civilization. Sophocles, Lope de Vega, Marlowe, Shakespeare, Moliere, Goethe, Ibsen, and others. (3-0-3) (H)

ENGL 341,Modern Drama
Study of major dramatists and movements in the theater since Ibsen and Strindberg, with special emphasis on such writers as Chekhov, Shaw, Brecht, O'Neill, Ionesco, and Pinter. (3-0-3) (H)

ENGL 342,Theater in Chicago
Designed to introduce students to the variety of professional theater performances in and around Chicago. Main emphasis on seeing plays, ancient to contemporary; essays and oral reports; study of dramatic genres and theater history. (3-0-3) (H)

ENGL 343,Film Analysis
Examination of the style and language of film as shown in a number of feature films, with emphasis on the various ways individual directors use the cinema for personal and cultural ends. (3-0-3) (H)

ENGL 345,The Art of the Novel
Analysis of the novel as a literary form with attention to its historical development and its function as a tool in the shaping of man's social, political, and cultural environment. (3-0-3) (H)

ENGL 347,The Novel Today
An examination of major world fiction since World War II. Readings will be chosen from such writers as Graham Greene, Alexander Solzhenitsyn, Heinrich Boll, Saul Bellow, Robertson Davies, and Gabriel Marquez. (3-0-3) (H)

ENGL348,American Poetry
Study of poetry and imaginative prose by recent American poets. Course includes the study of theoretical, literary, and social backgrounds of these works. (3-0-3)**(H)**

ENGL 351,American Literature Before 1900
Study of representative works of such writers as Franklin, Poe, Emerson, Hawthorne, Melville, Whitman, Mark Twain, Kate Chopin, and Emily Dickinson. (3-0-3) (H)

ENGL 353,Outside the Mainstream:: Ethnic and Minority Literature
An examination of works written by those authors often relegated ``outside the mainstream'' women, ethnic, and/or minority writers. Authors may include Alice Walker, Charlotte Perkins Gilman, Bernard Malamud, Isaac Bashevis Singer, Anne Sexton, and Richard Wright. (3-0-3) (H)

ENGL 356 Literature of the Third World
An examination of literatures of the "third world," from Asia, Africa, the Caribbean, and South America. Readings also include a limited number of "third world" wirters living in the U.S. This permits a comparison of different post-colonial contexts and their relevance to the U.S. (3-0-3) (H)

ENGL 360,Chicago in Literature
A survey of great American writers-novelists, poets, and dramatists--who have lived and worked in Chicago from the time of the Great Fire to the present day, and who have made Chicago one of the great world literary centers. Writers discussed include such figures as Theodore Dreiser, Carl Sandburg, and Richard Wright. (3-0-3) (H)

ENGL 366,Twentieth-Century American Literature
Study of such writers as Steinbeck, Frost, Eliot, Anderson, O'Neill, Hemingway, Wolfe, Faulkner, and contemporary writers such as Updike and Toni Morrison. (3-0-3) (H)

ENGL 371,Religion and Tradition of Romance
An historical examination of the beginning of English Literature to its first Golden Age under Elizabeth I: Arthurian romance, Chaucer, and English drama through Marlowe and Shakespeare. (3-0-3) (H)

ENGL 372,Science, Reason, and Imagination in English Literature
The impact of the Scientific Revolution of the seventeenth century and the Age of Reason upon English literature as expressed in the works of John Donne and the metaphysical poets, Milton, and later, Dryden, Pope, Fielding, and Johnson. (3-0-3) (H)

ENGL 373,The Romantic Rebellion and Its Aftermath
The foundations of modernism growing out of the upheaval that brought forth the poetry of Wordsworth, Keats, and Shelley, and a new vision of an industrialized world in the works of Dickens, Carlyle, Ruskin, and Tennyson. (3-0-3) (H)

ENGL 374,Twentieth-Century British Literature
Study of such writers as Shaw, Yeats, Virginia Woolf, Joyce, Huxley, Auden, Spender, and Dylan Thomas. (3-0-3) (H)

Note: No more than one of the following may be used for humanities General Education: ENGL 401, 411, 421, 423.

ENGL 401,Advanced Composition and Prose Analysis
Critical analysis of various types of prose, with stress on the art as well as the craft of writing. The student is required to write several critical papers. (3-0-3) (H: see note above)

ENGL 411,Workshop in Creative Writing
A workshop demonstrating principles of composition in fiction, poetry, or drama, studied from a writer's vantage point. Works by modern authors are analyzed. Student manuscripts are discussed and evaluated. (3-0-3) (H: see note above)

ENGL 421,Technical Writing
Principles and practice in the communication of technical materials. Writing of reports, articles, manuals, procedures, proposals. The use of technical graphics. Works by modern writers are analyzed. (3-0-3) (H: see note above)

ENGL 423,Communications for Management
Study and practice of business communications related to the productive and efficient management of personnel and resources. (3-0-3) (H: see note above)

ENGL 425,Writing Workshops
Writing workshops in professional fields, such as technical writing, arranged in cooperation with departments of the university or with industry. (3-0-3)

ENGL 427,Verbal and Visual Communication
Designed to assist students in effective integration of verbal and visual materials for presentation. Analysis of audience types and presentation situations. Practice in public address, oral reports, and panel discussions. Critiques. (2-0-2)

ENGL 429,Technical Editing
An introduction to the fundamentals of editing technical prose, with emphases on proofreading versus substantive editing, and on the art of conveying tables and supporting visual materials. (3-0-3)

ENGL 435,Organizational Communication
Examines the theory and practice of managing document projects and explores strategies for developing effective roles as technical writers and editors in an organization. (3-0-3)

ENGL 480,Special Problems in Shakespeare
An independent research project addressing a particular Shakespearean work or theme, to be arranged in advance with the instructor. Enrollment limited. Prerequisite: ENGL 337 or 338. (3-0-3) (H)

ENGL 485,Internship Program
A program of individual work and study designed to give the student practical experience in writing and editing scientific, technological, and managerial material. The student will work with an appropriate organization in these fields under the joint supervision of an editor or writer and a staff member at IIT and will design, write, and edit reports. (Credit: Variable)

ENGL 491,Independent Reading and Research
For advanced students. Prerequisite: Consent of department. (Credit: Variable) (H)

ENGL 497,Special Project
(Credit: Variable)

French
Foreign language courses below the 200 level may not be taken for General Education credit in Humanities. Most students may take 200-level foreign language courses for General Education in

the Humanities, but students seeking engineering degrees must receive the permission of the Dean of Armour College in order to assure that they satisfy accreditation requirements.

A student with prior acquaintance of a language is placed in a course at the proper level by the instructor. Most students with two years of high school French are prepared for FREN 201.

FREN 101,Elementary French I
An introduction to modern French, with exercises in translation, grammar, conversation, and comprehension. (3-0-3)

FREN 102,Elementary French II
A study of modern French emphasizing structural analysis and developing comprehension, translation, and conversation skills. Reading of selected French texts and exercises in composition. Prerequisite: FREN 101. (3-0-3)

FREN 201,Intermediate French I
Continuation of training in written and oral expression. Study of French literary works and composition of reports. Prerequisite: FREN 102. (3-0-3) (H)

FREN 202,Intermediate French II
Training towards fluency in modern French. Classroom analysis of French literature, with collateral readings, and with an emphasis on written reports. Prerequisite: FREN 201. (3-0-3) H)

German
Foreign language courses below the 200 level may not be taken for General Education credit in Humanities. Most students may take 200-level foreign language courses for General Education in the Humanities, but students seeking engineering degrees must receive the permission of the Dean of Armour College in order to assure that they satisfy accreditation requirements.

A student with prior acquaintance of a language is placed in a course at the proper level by the instructor. Most students with two years of high school German are prepared for GER 201.

GER 101,Elementary German I
An introduction to modern German, with exercises in translation, grammar, conversation, and comprehension. (3-0-3)

GER 102,Elementary German II
A study of modern German emphasizing structural analysis and developing comprehension, translation, and conversation skills. Reading of selected German texts and exercises in composition. Prerequisite: GER 101. (3-0-3)

GER 201,Intermediate German I
Continuation of training in written and oral expression. Study of German literary works and composition of reports. Prerequisite: GER 102. (3-0-3) (H)

GER 202,Intermediate German II
Training towards fluency in modern German. Classroom analysis of German literature, with collateral readings, and with an emphasis on written reports. Prerequisite: GER 201. (3-0-3) (H)

History
All history courses numbered 300 and above require as prerequisites satisfaction of the Basic Writing Requirement (usually by completion of ENGL 101) and a HUM 100-level course.

HIST 300,History of Western Civilization to the Renaissance
Development of Greek and Roman civilization; beginnings of Christianity; Europe in the Middle Ages; feudalism and manorialism; organization of the Church; the Crusades; medieval intellectual life; the Renaissance. (3-0-3) (H)

HIST 301,History of Western Civilization from the Renaissance
Protestant Reformation; the Scientific Revolution; Age of Louis XIV; Enlightenment; the Age of Democratic Revolution; Industrial Revolution; Nationalism and Imperialism; World War I; Communism and Fascism; World War II and after. (3-0-3) (H)

HIST 310,Nineteenth-Century Europe: 1789-1900
Survey and analysis of nineteenth-century European history. The French Revolution and Napoleon; conservatism, liberalism, and romanticism; Industrial Revolution; nationalism and the unification of nation states; revolutions of 1848; imperialism, and major intellectual movements. (3-0-3) (H)

HIST 311,Twentieth-Century Europe:, 1890-1945
Nationalism and nation states; patterns of diplomacy; origins, conduct, and settlement of World War I; Russian Revolution; fate of democracy; rise of totalitarianism; World War II and the Holocaust. (3-0-3) (H)

HIST 312,Introduction to Contemporary Europe:, 1945-Present
Settlement of World War II; political and economic reconstruction; Cold War; Third World nationalism and the end of colonialism; the United States and Europe; Soviet Union and Eastern Europe from Stalin to Gorbachev; the end of communism in Eastern Europe and the disintegration of the Soviet Union. (3-0-3) (H)

HIST 320,Nineteenth-Century European Intellectual and Cultural History
Survey of major developments in political, literary, scientific, religious, philosophical, and social thought. Topics vary and may include Romanticism, Positivism, Liberalism, Socialism, Darwinism, Religion and Science Controversy, and movements in art and literature. (3-0-3) (H)

HIST 321,Twentieth-Century European Intellectual and Cultural History
Survey of major developments in political, literary, scientific, religious, philosophical, and social thought. Topics vary and may include Neo-Idealism, Neo-Marxism, and Neo-Orthodoxy; Freud and Jung; Durkheim and Weber; the New Physics; Weimar Culture; and Existentialism. (3-0-3) (H)

HIST 333,Ethnicity in American History and Life
Examines the creation of the American nationality from its diverse roots, which include almost all of the world's great cultures. Special stress on immigration, African American history, and the relationships among concepts of race, class, and gender. (3-0-3) (H)

HIST 334,The Creation of America:: The New World to 1789
Examines how the U.S., its values, and institutions came to be. Colonization, ``Indian'' relations, slavery, the American Revolution, and the Constitution are studied in the context of the colonial world, including Latin America. Controversial issues and the challenge of discovery are stressed. (3-0-3) (H)

HIST 336,The Industrialization of America:, 1789-1898
Traces America's transformation from agrarian republic to Industrial Empire. Stresses impact of industrialization on all aspects of life, the nature of slavery, the failures of ``Reconstruction,'' and the western and urban frontiers. Explores the adventures that made America a great power. (3-0-3) (H)

HIST 337,The American Century:, 1898-1975
Traces how America attained economic and military power and what she did with that power at home and abroad. Discusses the World Wars, the Great Depression, the limits of the ``welfare state,'' the movement for Black equality, and the transformations of the 1960s. (3-0-3) (H)

HIST 338,Contemporary America: 1960 and After
Explores the historical roots of contemporary issues. Topics vary by semester but always include the Cold War and America's international position, tensions over immigration and racial integration, and the historic roots of changes in popular culture and daily life. (3-0-3) (H)

HIST 340,History of American Business
Surveys America's ``business civilization'' and the forces shaping its institutions. Charts advent of management, marketing, decentralization, and evolving government-business relations. Concludes with ``reindustrialization'' case study. (3-0-3) (H)

HIST 341,Modern East Asia
A survey of East Asia history since 1800, with a special emphasis on the political and cultural history of China, Japan, and the Koreas. (3-0-3) (H)

HIST 346,America and Vietnam
Utilizing video materials, course covers the history of Vietnam under French domination, independence, civil war, and the eventual participation of the United States in its longest and most divisive war. (3-1-3) (H)

HIST 349,Afro-American Experience
A study of the Afro-American experience since 1800, including African roots, formal and informal institutions of oppression, change in continuity in folk culture, and history of social institutions. (3-0-3) **(H)**

HIST 350,U.S. Urban History
Basic facts and issues of U.S. urban history; reasons for the growth, development, and decay of cities; origins of contemporary urban political, social, and economic problems. (3-0-3) (H)

HIST 352,History of Chicago
Basic institutions of the contemporary city studied in their historical context, using Chicago as a case study. Political machines,social and political reform traditions, planning agencies, ethnic neighborhoods, organized crime, and many other urban institutions. (3-0-3) (H)

HIST 372,History of Engineering
An introduction to the history of engineering in the United States. The course will focus on the contributions of individual engineers and a social history of the engineering profession. (3-0-3) (H)

HIST 380,The Origins of Modern Science
An examination of the profound change in our conception of the natural world from Copernicus (1500 A.D.) to Newton (1700 A.D.). How the adoption of experimentation, quantification, and new instruments created a new conception of scientific method and the goals and nature of scientific knowledge. (3-0-3) (H)

HIST 381,Science in Industrial Society 1750 -1900
The transformation of the physical and biological sciences from the Enlightenment to the 20th Century and its effects on culture, politics, and belief; the creation of science-based technologies and the creation of the profession of scientist. Prerequisites: ENGL 101, HUM 102, or equivalents. (3-0-3) (H)

HIST 382,Technology in History:, 1500 -1850
Explores the process of technological change during the birth of industrial societies. Considers the context of early industrial development in Europe, then examines the industrial revolution in Britain and America. Concludes by assessing technology's role in European domination of Asia and Africa. (3-0-3) (H)

HIST 383,Technology in History:, 1850 to Present
Examines technological change as a characteristic activity of modern societies. Investigates the science-based ``second'' industrial revolution in Europe and America. Explores the varied responses of artists, writers, architects, and philosophers to the machine age. Concludes by discussing technology's place in the modern nation-state. (3-0-3) (H)

HIST 384,Science in the Twentieth Century
Development of quantum theory, relativity, and molecular biology; the growth of science to its present important position in government, economic life, and technological development. (3-0-3) (H)

HIST 491,Independent Reading and
Research
For advanced students. Prerequisite: Consent of department. (Credit: Variable) (H)
HIST 494,Senior Seminar in European History (3-0-3)
HIST 495,Senior Seminar in American History (3-0-3)
HIST 496,Senior Seminar in Urban History (3-0-3)
HIST 497,Senior Seminar in the History of Science and Technology (3-0-3)

Humanities Courses
The Basic Writing Proficiency requirement is a prerequisite for all Humanities courses. This requirement is usually satisfied by the completion of ENGL 101 or its equivalent. All 300-level Humanities courses also require the completion of a HUM 100-level course as prerequisite.

HUM 102,Industrial Culture
An interdisciplinary course which examines the development of modern industrial society and the impact of science and technology on our culture. Readings drawn from history, literature, and philosophy. (3-0-3) (H)

HUM 104,Age of Darwin
An introduction to the humanities through an investigation of important changes in our culture associated with Darwin's theory of evolution. Readings drawn from literature, philosophy, and science. (3-0-3) (H)

HUM 106,Life Stories
An interdisciplinary study of autobiographies, written chiefly by Americans. The syllabus varies, but may include Harriet Jacobs, Maya Angelou, Malcolm X, Richard Rodriguez, Thomas Merton, Frank Lloyd Wright. In addition to considering the nature of autobiography as a genre, the course examines the historical events and the philosophical issues that have shaped the lives and attitudes of these writers. (3-0-3) (H)

HUM 315, Creativity in Art, Science, and Technology
An exploration of processes of creative thinking and action across the fields of art, science, and technology. The course examines creative cognitive styles, creativity in individuals, and the dynamics of creative groups. It aims to discover patterns of thought or techniques that can enhance creativity. Empahsis on student projects. (3-0-3) (H)

Music History and Appreciation

MHA 301,Introduction to Music

The aim of the course is to familiarize the student with the language of Western music and to enhance his or her listening enjoyment. The course will present musical examples ranging from seventeenth-century polyphonic music to contemporary jazz in order to extract from these styles a view of the basic components of musical experience: rhythm, melody, harmony, color, and structure. Prerequisites: ENGL 101 or equivalent and HUM 100-level course. (3-0-3) (H)

Philosophy
All philosophy courses numbered above 300 require as prerequisites satisfaction of the Basic Writing Requirement (usually by completion of ENGL 101) and a HUM 100-level course.

PHIL 301,Ancient Philosophy
A study of major works by Plato, Aristotle, and other important ancient philosophers. (3-0-3) (H)

PHIL 302,Origins of Modern Philosophy
A study of major 17th and 18th century philosophers, such as Descartes, Hobbes, Spinoza, Locke, Leibniz, Berkeley, Hume, and Kant. (3-0-3) (H)

PHIL 304,19th Century Philosophy
A study of major 19th century philosophers, such as Hegel, Comte, J. S. Mill, Peirce, James, Nietzsche. (3-0-3) (H)

PHIL 305,20th Century Philosophy
A study of recent philosophical trends (or movements), including logical positivism, existentialism, ordinary language philosophy, etc. (3-0-3) (H)

PHIL 310,American Philosophy
A survey of the most important thinkers and movements in American Philosophy. (3-0-3) (H)

PHIL 311,Great Philosophers
An in-depth study of a single outstanding philosopher, chosen by the instructor. The focus of the course will be announced when the course is scheduled. (3-0-3) (H)

PHIL 326,Philosophy of Language
An analysis of the concept of language in both the works of philosophers and the works of linguists. The course looks into theories of linguistic meaning, sentence structure, the speech acts, and the assumptions underlying research in modern linguistics. (3-0-3) (H)

PHIL 335,Theory of Knowledge
An inquiry into how knowledge in general is possible, whether we can achieve certainty, and the role of reason and experience in the acquisition of knowledge. (3-0-3) (H)

PHIL 340,Symbolic Logic
An introduction to propositional and predicate calculus, with applications to the theory of language, the concept of argumentation, and the foundations of mathematics. (3-0-3)

PHIL 341,Philosophy of Science
Through an analysis of the concepts of explanation, theory, hypothesis, experiment, and observation, this course seeks an understanding of how the growth of scientific knowledge is possible. (3-0-3) (H)

PHIL 342,Philosophy of Mind
An examination of the conception of ``mind'' as opposed to body, and its implications for psychology, artificial intelligence, and neuroscience. (3-0-3) (H)

PHIL 343,Philosophy of Social Inquiry
An examination of the methods and theories of the social sciences, especially sociology and anthropology, and their relationships to the natural sciences. (3-0-3) (H)

PHIL 344,Proof and Paradox
An investigation into problems of the foundations of mathematics, the concept of proof, the relationship of mathematics to logic, the reality of mathematics, etc. (3-0-3) (H)

PHIL 345,Space and Time
An investigation into philosophical problems of space and time raised by modern physics and geometry. Issues include problems raised by studies of relativity, the topology of space and time, the direction of time, etc. (3-0-3) (H)

PHIL 346,Philosophy of the Life Sciences
An examination of the philosophical problems arising from the study of the biological sciences, including controversies in evolutionary theory and the reduction of biology to physics and chemistry. (3-0-3) (H)

PHIL 350,Science and Method
A history of the interaction between science and philosophy in recent centuries, showing how changing conceptions of metaphysics and scientific method have influenced the development of Renaissance astronomy, nineteenth century atomic theory, ether theories, theories of geological and biological change, etc. (3-0-3) (H)

PHIL 360,Ethics
A study of the fundamental issues of moral philosophy. (3-0-3) (H)

PHIL 361,Political and Social Philosophy
An analysis of the concepts of legitimate political authority, social justice, natural rights, sovereignty, etc. (3-0-3) (H)

PHIL 362,Philosophy of Law
An analysis of the concept of law and how it differs from custom, religion, and morality. The course looks into issues of judicial reasoning, the assumptions that underlie the criminal justice system and the imposition of liability, and legal ethics. (3-0-3) (H)

PHIL 363,Aesthetics
The philosophy of the fine arts, including an analysis of the concepts of beauty, representation, expression, and the purpose of art. (3-0-3) (H)

PHIL 370,Moral Issues in Engineering
A study of the problems of moral and social responsibility for the engineering profession, including such topics as safety, confidentiality, government regulation, etc. (3-0-3) (H)

PHIL 371,Moral Issues in Architecture and City and Regional Planning
Examination of moral problems faced by architects and planners; the concept of professional behavior. (3-0-3) (H)

PHIL 373,Business Ethics
Ethical issues relating to individual and corporate responsibility, self- and governmental regulation, investment, advertising, urban problems, the environment, preferential hiring. (3-0-3) (H)

PHIL 374,Moral Issues in Computer Science
Moral problems that confront professionals in computer-related fields, including questions raised by the concept of intellectual property and its relationship to computer software, professional codes of ethics for computer use, responsibility for harm resulting from the misuse of computers. (3-0-3) (H)

PHIL 380,Topics in Philosophy
An investigation into a topic of current interest in philosophy. The topic for the course will be announced by the instructor when the course is scheduled. (3-0-3) (H)

PHIL 490/491,Independent Study
Supervised individual research for advanced students. (Credit: Variable.) [H: with permission of the Dean of Lewis College]

Spanish
Foreign language courses below the 200 level may not be taken for General Education credit in Humanities. Most students may take 200-level foreign language courses for General Education in the Humanities, but students seeking engineering degrees must receive the permission of the Dean of Armour College in order to assure that they satisfy accreditation requirements.

A student with prior acquaintance of a language is placed in a course at the proper level by the instructor. Most students with two years of high school Spanish are prepared for SPAN 201.

SPAN 101,Elementary Spanish I
An introduction to modern Spanish, with exercises in translation, grammar, conversation, and comprehension. (3-0-3)

SPAN 102,Elementary Spanish II
A study of modern Spanish emphasizing structural analysis and developing comprehension, translation, and conversation skills. Reading of selected Spanish texts and exercises in composition. Prerequisite: SPAN 101. (3-0-3)

SPAN 201,Intermediate Spanish I
Continuation of training in written and oral expression. Study of Spanish literary works and composition of reports. Prerequisite: SPAN 102. (3-0-3) (H)

SPAN 202,Intermediate Spanish II
Training towards fluency in modern Spanish. Classroom analysis of Spanish literature, with collateral readings, and with an emphasis on written reports. Prerequisite: SPAN 201. (3-0-3) (H)

INSTITUTE OF DESIGN

Director:Mr. Patrick F. WhitneyIITRI Research TowerExtension 85300
Professors:Owen, Whitney
Associate Professors:Fahnstrom, Grimes, Heskett, Prygrocki
Visiting Faculty:Hartman, Keeley, Mead, Nemeth, Pycha, Robinson, Thaler, Velazquez, Wolke, Zihlman

The undergraduate program at the Institute of Design leads to the degree of Bachelor of Science in design with professional specializations in communication design, photography, and product design.

The goals of the program are:
To educate students in the aesthetic, social, humanistic, and technological fields related to design, to provide specialized professional education; to offer students a methodology for continuing self-education based on an experimental approach to the solution of problems; to increase aesthetic sensitivity and an understanding of human factors and culture in the production of objects and communications; to investigate the creative use of media and machines.

The requirements for the B.S. degree are:

A. ID core courses: During the sophomore year, each student must complete the following courses: ID 253, 254, 255, 256, 257, 258. A 2.75 grade point average is expected in these courses to proceed to the junior year.
B. Professional specialization courses: In the junior and senior years, each student completes one of the following sets of five professional specialization courses: ID 308, 410, 411, 493, 494; ID 312, 414, 415, 493, 494; ID 316, 418, 419, 493, 494. A 2.75 average is expected in these courses.
C. Professional electives: All ID courses listed at the 300 and 400 levels may be used as professional electives.

Curriculum

First

ID 101	1	3	2
ID 103	1	3	2
ID 107	1	3	2
ID 110	3	0	3
ID 111**	1	3	2
MATH 121***	3	0	3
ENGL 101	3	0	3
Totals	13	12	17

Third Semester

ID201	3	0	3
ID Core Course (3)	3	9	6
PHYS 211	3	0	3
Social Sciences Elective	3	0	3
Totals	12	9	15

Fifth Semester

ID Prof. Specialization	2	6	4
ID Prof. Elective	2-	30-	33
Minor Elective	3	0	3
Unrestricted Elective	3	0	3
Humanities Elective	3	0	3
Totals	13-14	6-9	16

Seventh Semester

ID493	2-	30-33	
ID Prof. Specialization	2	6	4
ID Prof. Elective	2-3	0-3	3
Minor Elective	3	0	3

Humanities Elective	3	0	3
Totals	12-14	6-12	16

Second

ID102	1	3	2
ID104	1	3	2
CS103*	2	2	
ID117	0	2	1
ID108	1	3	2
ID112**	1	3	2
MATH 122***	3	0	3
HUM 100-level course	3	0	3
Totals	12	15	17

Fourth Semester

ID202	3	0	3
ID Core Courses (3)	3	9	6
Minor Elective	3	0	3
PHYS212	3	0	3
Social Sciences Elective	3	0	3
Totals	15	9	18

Sixth Semester

ID Prof. Specialization	2	6	4
ID Prof. Elective	2-3	0-3	3
Minor Elective	3	0	3
Biol. or Chem. Elective	3	0	3
Social Sciences Elective	3	0	3
Totals	13-14	6-9	16

Eighth Semester

ID494	2	6	4
ID Professional Elective	2-3	0-3	3
Natural Science or Engineering Elective	3	0	3
Minor Elective	3	0	3
Social Sciences Elective	3	0	3
Totals	13-14	6-9	16
Total Credit Hours			131 minimum

* Advanced students may substitute CS 200 with the consent of the instructor.

** Students transferring from the Department of Architecture to the Institute of Design may substitute ARCH 109 and 110 for ID 111 and 112.

*** Students may substitute MATH 151 for MATH 121 and 122, but still must complete 131 credits. Advanced students may substitute MATH 151, 152, 161, or 162 with the consent of the instructor.

ID Core Courses are ID 253, 254, 255, 256, 257, 258.

Advanced students may substitute PHYS 103, 104, and 203 with the consent of the instructor.

Lecture and credit hours will vary. Consult individual course descriptions for clarification.

Design Processes Laboratory

The Institute of Design's state-of-the-art computer systems apply computer technology to design methodology. With its Alias software and Hewlett-Packard, Silicon Graphics, Sun, and DEC computers, the laboratory allows students to use computer techniques to see and create forms and images that are difficult or impossible using manual methods. The Design Processes Laboratory is used to support design research, thesis work, projects, and classes.

Program Options

All entering undergraduate students complete a core program in which they explore visual esthetics, basics of the practice of design, materials, and design processes and their application to design problems. This program introduces the basic areas of product design, communication design, and photography. During the junior and senior years, each student completes a four-semester sequence of courses. These are devoted to increasingly complex problems in the professional specialization elected by the student. The program of each student culminates with a thesis project.

Communication Design is concerned with the planning and development of information to communicate ideas, instructions, directions, and emotions, through a variety of media including printed publications, exhibitions, multimedia, video, and computers.

Photography is concerned with documenting the contemporary world and with the digital manipulation of images.

Product Design is concerned with the planning, development, and production of a wide variety of specialized systems and equipment such as consumer products, medical instruments, packaging systems, unique tools for use in alien environments, and hundreds of other necessities in a technological society.

Electives

Through a series of electives from the sophomore through senior years, a student may study areas related to his or her professional goals. Fifteen credit hours of these electives make up a minor.

Because design is an integrative discipline, students may select a minor that will enable them to gain specific expertise in professional areas outside their majors in the Institute of Design. For example, the minor in management leads to the B.S./M.B.A. in five rather than six years.

Students selecting a minor from the Institute of Design's professional specialization areas must first consult with the director.
The listing of minors begins on page 28.

Course Descriptions

ID 101,Basic Two-Dimensional Design
This course introduces students to concepts materials and processes of two dimensional form and space. (1-3-2)

ID 102,Basic Two-Dimensional Design
This is a continuation of two-dimensional design with the introduction of letter forms, verbal messages, and color. Prerequisite: ID 101.(1-3-2)

ID 103,Basic Three-Dimensional Design
A basic three-dimensional program using elementary tools and materials to fabricate structures that explore form and space. A series of projects is assigned, each highlighting a particular spatial problem of structure and aesthetics. (1-3-2)

ID 104,Basic Three-Dimensional Design
Continuation of basic three-dimensional design. Projects are fabricated using industrial materials including metal, plastic, glass, and wood. Prerequisite: ID 103. (1-3-2)

ID 107,Representation I
Introduction to issues of representation using the photographic media. Basic photographic skills are developed. (1-3-2)

ID 108,Representation II
The continuation of ID 107 emphasizing more complex ideas of representation. Emphasis is on how the photographic image can communicate through form and content. Prerequisite: ID 107. (1-3-2)

ID 110,Introduction to Design
A series of lectures and projects introducing basic concepts of design practice. Included are discussions of the relationships between design and society and options for careers in the various design specialties. Assigned reading. (3-0-3)

ID 111,Technical Drawing I
This is the introduction to the basic principles of drawing methods. (1-3-2)

ID 112,Technical Drawing II
Continuation of ID 111 emphasizing specific drawing skills necessary to the design fields. The relationship between verbal and visual message systems is explored. This course fulfills the Architecture, Planning, and Design drawing requirement. Prerequisite: ID 111. (1-3-2)

ID 113,Photography I
Introduction to basic techniques of photography and the examination of their visual and aesthetic values. Covers specific photographic techniques used in architecture and engineering. (2-1-2)

ID 114,Three-Dimensional Design Workshop
Basic three-dimensional program using elementary tools and materials to fabricate structures that explore form and space. Processes for the development of model-making techniques are reviewed and explored in the context of specific design projects. A synthesis of visual ability and manipulative skills essential for architectural model making required in upper-level work. (1-2-2)

ID 117,Computers in Design
Introduction to design and PC software. Typically will include word processing, spreadsheets, graphics, data communications, and database software. Same as CS 117. (2-2-1)

ID 201,Design History I
This course introduces students to the relationship between design and the history of culture and technology. (3-0-3)

ID 202,Design History II
This course allows more detailed study of design history with a particular emphasis on significant developments of the 20th century. Prerequisite: ID 201 or consent of the instructor. (3-0-3)

ID 203,Introduction to Art
Highlights of the significant periods in the history of art and architecture. Examination of the relationships among architecture, painting, and sculpture. Evaluation of architecture and art in their social and cultural context. Frequent trips to museums and galleries are required. (1-0-1)

ID 204,Design:, Technology:, and Culture
A series of lectures and seminars about the interrelationships between communication and product design, technological development, and cultural values. (3-0-3)

ID 253,Basic Communication Design
(ID Core) Introduction to graphic design and visual message-making as a language. Emphasis will be placed on typography, including the semantics of typographic form, the relationships between

words, images, and meaning, and the relationship between a message and its audience. Prerequisite: ID 102. (1-3-2)

ID 254,Basic Communication Design
(ID Core) Continuation of basic visual communication. This continues the emphasis on typography and involves students in more substantial projects which include mock-up evaluation and ordering complex information into systems. Prerequisite: ID 253 or consent of the instructor. (3-3-2)

ID 255,Basic Product Design
(ID Core) Introduction to product design principles in the production of mass-produced products and in the application of human factors criteria in the analysis and design of simple tools and other products. Students produce products in prototype form. Prerequisite: ID 104. (3-3-2)

ID 256,Basic Product Design
(ID Core) Continuation of product design and human factors principles in projects covering a range of mass-produced products. Prepares the student for advanced work in product design. Prerequisite: ID 255 or consent of the instructor. (1-3-2)

ID 257,Photography
(ID Core) Continuation of the development of competence with the photographic image. A variety of media and formats are explored. Prerequisite: ID 105. (1-3-2)

ID 258,Photography
(ID Core) Color photography in 35mm color transparency format. Extensions of the basics of professional photography. Includes study of images in series; documentation and presentation techniques. Prerequisite: ID 113. (1-3-2)

ID 308,Communication Design
The principles of communication design. In this course students identify and analyze problems, develop content, evaluate alternative solutions and produce prototypical solutions. Each project begins with the analysis of communication needs and progresses through the production of items in prototype form. Prerequisite: ID 254. (2-6-4)

ID 312,Product Design
The design of equipment for human use. Projects drawn from consumer, industrial, or institutional fields are used to develop the processes of detail design. Function, ergonomics, and appearance along with associated

problems of manufacturability, serviceability, and conservation of resources and energy are considered. Projects are completed as full-scale models or prototypes with appropriate communication and presentation aids. Prerequisites: ID 255 and 256. (2-6-4)

ID 316,Photography
Documentary photography with emphasis on the development of a personal viewpoint. The relationships between visual and verbal communication will be explored. Prerequisite: ID 258. (2-6-4)

ID 331,Structured Planning
Lectures dealing with the theory and application of problem structuring methods used in design. Topics examined include graph-theoretic techniques, taxonomic organizational measures, and computer-aided methods for hierarchical decomposition and condensation processes. Specialized methods are considered in the contexts of overall strategies for planning and design projects with emphasis on techniques for assembling and using subjective and qualitative information as well as quantitative information in the design process. (3-0-3)

ID 333,Introduction to Design Theory
Theoretical basis for the design process. Design problem-solving through history is examined along with the cultural basis for design and modern interpretations of the nature of the design process. (3-0-3)

ID 335,Production Methods
Introduction to basic manufacturing materials, methods, and processes from the designer's perspective. (3-0-3)

ID 336,Typography
Investigative research into the development of typography, past to present, plus typographic experimentation with properties and processes. (3-0-3)

ID 340,Information Development
Processes for obtaining, organizing, and analyzing information necessary to the design task. A wide range of resources and techniques are explored to introduce the breadth and depth of information available to the design analyst. (3-0-3)

ID 352,Presentation Media
An investigation of 35mm photography as a presentation method for visual communications. Various techniques will be covered to bring the student up to a level of proficiency with the single lens reflex camera and the programming and production equipment used in multimedia presentations. (2-3-3)

ID 354,Photography
A middle-level course in photography that includes documentary and reportorial work in black and white. Higher level of lab work covered to give student the beginning of professional competence. Prerequisite: ID 258. (2-3-3)

ID 355,Advanced Workshop
Processes for experimental product development. Techniques for advanced model making and prototype construction are reviewed and explored in the contexts of specific design projects. (2-3-3)

ID 360,Visualization Techniques
Exploration of various techniques for representation of designed objects and organization of presentation materials. (2-3-3)

ID 363,Packaging Design
Exploration of the various functions of the package, including container construction and applied communication graphics. Students produce complete packages in prototype form. (2-3-3)

ID 364,Exhibition Design
The presentation of information in space and time. From an investigation of the nature of concepts or the character of materials to be presented, scripts are prepared and appropriate two- and three-dimensional exhibition elements are developed. Scale models, produced to simulate full exhibit environments, are built and photographed. (2-3-3)

ID 366,Documentary Photography
Continuation of the middle-level course emphasizing the control and manipulation of the rendition of a subject with various types of cameras and lenses. Architecture, extreme wide-angle and

telephoto lenses, and special purpose cameras will be explored. Prerequisite: ID 257 or 258. (2-3-3)

ID 370,Photographic Tools and Techniques
A detailed study of the optics, chemistry, and techniques of photography as a means of understanding and controlling the process of photography for the expression of ideas. (2-3-3)

ID 372,Technical Photography
Covers the specific photographic techniques used in science, medicine and engineering; includes lighting, micro and macro photography, infrared and UV techniques. Prerequisite: ID 257 or consent of instructor. (2-3-3)

ID 380,Color
An investigation of the uses of color in the solution of visual problems using a variety of media. Emphasis is placed on the interaction of form, color, proportion, and composition on a two-dimensional surface. (2-3-3)

ID 387,Vision and Form
A study of form and structure using the principles and techniques of drawing. (2-3-3)

ID 410,Advanced Communication Design
This is a senior-level course in which students research and develop projects that explore major issues. The project tends to be large and requires students to develop content and do extensive research. Prerequisite: ID 254. (2-6-4)

ID 411,Advanced Communication Design
Design methods and team approaches are stressed. In this class students are expected to take a large degree of responsibility for the ideas and direction of their projects. Prerequisite: ID 254. (2-6-4)

ID 414,Environmental Design
Study of man/machine, man/workspace, and man/environment relationships. Case studies are made of physical dysfunctions in operating systems. Through behavioral mapping, interaction techniques, and other design methods, points of conflict between man and environment are located, new design criteria are formulated, and physical solutions are generated as design proposals. Solutions are presented as environmental models or, where possible, full-scale mock-ups. (2-6-4)

ID 415,Systems and Systematic Design
Application of systematic design methods to complex design problems at the system level. Team problem-solving techniques are emphasized with computer-supported design processes used in various stages of analytic, synthetic, and evaluative phases of a design project. Prerequisite: ID 331 or consent of instructor. (2-6-4)

ID 418,Color Photography
A major course in the fundamentals of color images. The laboratory experience prepares the student to produce both reflection prints and transparencies. Communications applications are stressed. (2-6-4)

ID 419,Editorial Illustration
The application of photography as a means of communication. Projects will involve the production of sequential photographic statements with or without graphics and verbal reinforcement in base form. Prerequisite: ID 257. (2-6-4)

ID 422,Movable Imagery
The techniques and uses of graphics and photographic images in communications emphasizing multimedia and other time-bound presentation formats. Prerequisite: ID 258. (2-3-3)

ID 426,Photography
An intensive investigation of the experimental variations available for expressive purposes. Optical, chemical, tonal, and temporal manipulations may be explored. Prerequisite: ID 258. (2-3-3)

ID 439,History of Photography I
A history of mechanical image making from the Renaissance through World War I. The relationship between evolving cultural patterns and various traditions of photography will be investigated in depth. Prerequisite: ID 101 or consent of instructor. (3-0-3)

ID 445,History of Photography II
A study of the development of modern photography from the photo-secession through World War II. Intensive analysis of individual styles. Prerequisite: ID 102 or consent of instructor. (3-0-3)

ID 447,Design Methodology
A survey of techniques used in the phases of design process from analysis through synthesis and evaluation. Topics covered include diagrammatic analysis and synthesis processes, system description, uses of semantic differential for the analysis of meaning, morphological analysis and synthesis, creativity stimulation techniques, delphi decision theory, and models for decision-making in contexts of certainty, uncertainty, and competition. (3-0-3)

ID 459,Visual Symbology
An investigation of visual symbols as they are used in communication. The student will produce various experiments in the development of visual symbols to suit specific communication needs. (2-3-3)

ID 466,Human Factors
Research techniques in human factors and design. Analytic procedures to identify and define problems in dysfunctioning environmental systems are introduced and field assignments made to survey activities in existing system environments. Data, procedures, and conclusions are presented in reports. (3-0-3)

ID 467,Control Technology in Design
The incorporation of advanced microcomputer processes in product and system design. Elements of the design of computer logic in both software and hardware are introduced and microcomputers are built from experimental laboratory kits. Processes are designed using the microcomputers as breadboard controllers for working prototype and products. Prerequisite: PHYS 212 and CS 100 or equivalent. (2-3-3)

ID 468,Computer Techniques in Image Making
The development and manipulation of graphic images by computer. Data structures for constructing, storing, and retrieving images are examined and various representation techniques studied. Programs are written to manipulate, transform, and project two- and three-dimen-sional forms for viewing. Prerequisite: ID 253 or ID 254 and CS 200; or consent of instructor. (3-0-3)

ID 493,Thesis Research
Advanced investigation in the student's area of professional specialization, chosen in consultation with the student's faculty adviser. (2-3-3)

D 494,Thesis Project
Development of thesis project including documentation and presentation of research findings and final recommendations. Prerequisite: ID 493. (2-6-4).

ID 498,Individual Study
Advanced investigation in the student's area of interest. Prerequisite: Outstanding previous performance and consent of department. (Credit: Variable)

Graduate Courses
See the current IIT Bulletin: Graduate Programs.

LEGAL STUDIES

Legal Studies Adviser:Dr. Paul DeForest292 Life SciencesExtension 75131
The IIT curriculum, through its challenging majors, minors, and general education requirements, provides students with a solid preparation for legal study. The legal studies adviser can counsel students who plan to enter law school about their undergraduate programs and help them with law school admissions procedures.

Law schools encourage undergraduates to major in interesting and demanding disciplines. Although the liberal arts and social sciences provide the majority of law school applicants, IIT students majoring in natural sciences, engineering, management, architecture, and design have been very successful in achieving admission to leading law schools. Prospective lawyers are encouraged to enrich their undergraduate educations with courses in humanities, mathematics, the natural sciences, management, and the political and social sciences. Law school admission committees are impressed by evidence that students have taken a diversity of courses that challenge them intellectually and help them to develop analytical reasoning and writing skills. Excellent grades and scores on the Law School Admission Test (LSAT) will maximize prospects of gaining admission to the more selective law schools. Regardless of major study, courses in the following fields are recommended as providing excellent general education for the study of law:

* English language and literature to develop facility in reading and writing;

* Philosophy to promote logical reasoning skills;

* Political science to gain awareness of governmental institutions through which law is made and applied;

* History to ensure understanding of how U.S. law is rooted in the Anglo-American experience;

* Economics and management because of their importance to many fields of law;

* Statistics, accounting, and computer science to sharpen analytical skills.

Prospective IIT students interested in careers in law might consider two accelerated B.S./J.D. programs offered with Chicago-Kent College of Law. Students pursuing the double degree programs described below should consult regularly with both their major academic advisers and the legal studies adviser to ensure that all prerequisites to gaining admission to Chicago-Kent College of Law are completed on time.

All students planning or contemplating applications to law school should meet regularly with the legal studies adviser to discuss course preparation and procedures for application to law school. This adviser maintains a collection of current law school catalogs, comparative guides to legal study, and application forms for the LSAT.

Chicago-Kent College of Law offers a minor for IIT undergraduates. This minor is only open to a small number of qualified students who are prepared to take courses at the campus at 565 W. Adams St., Chicago, and who satisfy the admission standards set by the Chicago-Kent College of Law. See page 31.

Bachelor's/J.D. (``3 3 Option'') Double Degree Program
Qualified students may earn both a bachelor's degree at IIT and the Juris Doctor degree at the College of Law in six years, rather than the normal seven years. Fulfillment of this option requires early expression of intent on the part of interested students, careful planning of undergraduate programs in cooperation with the departmental and legal studies advisers, the attainment of at least a prescribed minimum level of performance as an undergraduate (measured by the GPA), and a demonstrated aptitude for success in law school (measured by the LSAT score).

The “3 3 option" is applicable to the following majors at IIT:

1. All liberal arts and sciences B.A. and B.S. degree fields.

2. The B.S. in Business Administration degree program.

This option is not available to majors in engineering, architecture, or design.
An IIT student planning to major in one of the applicable subject areas who wishes to pursue the “3 3 option" should inform the departmental and legal studies advisers as early as possible after admission to IIT, but no later than the third semester. The legal studies adviser will then inform the Admissions Office of the Chicago-Kent College of Law. Because careful planning is required to ensure completion of all major and distribution requirements within three academic years, those deciding after the third semester to pursue the option may be required to extend their undergraduate study at IIT beyond three years. A student transferring to IIT with sophomore and especially junior standing should expect to be delayed a semester or more, although the delay will vary depending upon the student's undergraduate major.

After declaration of intent to pursue the ``3 3 option," the student will work with the legal studies adviser and the departmental adviser to plan a program that satisfies departmental major requirements (defined on the relevant pages of this Bulletin) and the minimal distribution requirements of the General Education Program. An overall minimum of 98 credit hours must be completed at IIT (or 45 hours in the case of transfer students).

During the final year of study at IIT, the student will be allowed to apply for admission to Chicago-Kent College of Law.

Admission will be determined on the basis of criteria established by the Admissions Committee of Chicago-Kent College of Law, including overall academic performance, potential for success in law school, and the LSAT score. A student admitted to Chicago-Kent College of Law under the ``3 3 option" will enter

the first year of law studies at the beginning of the senior year. Twenty-eight credit hours successfully completed during the first year at Chicago-Kent College of Law will be credited as a minor in the undergraduate program. A bachelor's degree in the appropriate field will then be awarded by IIT at the end of the first year at the College of Law. The Juris Doctor degree will be awarded upon the successful completion of the final two years of the curriculum at the College of Law.

For more information, consult the legal studies adviser, (312) 567 -5131.
Honors Law Program
The Honors Law Program permits students to receive both bachelor's and law degrees in six years, rather than the normal seven. Students who are admitted to the Honors Law Program are conditionally admitted to Chicago-Kent College of Law of Illinois Institute of Technology at the same time they are admitted to IIT. They may continue in the program as long as they maintain an undergraduate GPA of 3.0 and score well on the Law School Admission Test (LSAT) in the third year of the program.

The program is only available to new IIT freshmen who are specially prepared to complete it. Prospective IIT honors students in engineering, liberal arts, sciences, and business programs may apply. Applicants should rank in the top 10 percent of their high school classes, score in the top 10 percent on the SAT or ACT, and be interviewed by representatives of IIT and the Chicago-Kent College of Law. During the admissions process, a program of study will be prepared that leads to a bachelor's degree in the student's chosen field within four years and a Juris Doctorate (J.D.) within two additional years. For more information, contact Dr. Paul DeForest, Legal Studies Adviser, (312) 567-5131.

MATHEMATICS

Acting Chairman:Dr. Barbara Heller 208 Engineering 1 Extension 73162
Professors:B. Bernstein, Deliyannis, Edelstein, Erber, Sklar, Tao
Associate Professors:Frank, Heller, Lubin, Olsen, Pearson, Stueben
Assistant Professors:Adler, Nguyen, Sitton, Wang
Instructor:Maslanka
Faculty Emeriti:Darsow, De Cicco, Reingold, Wilcox

Bachelor of Science

IIT's Bachelor of Science in Mathematics is primarily a program in applied mathematics. It provides the student with the fundamentals of the major areas of mathematics, with special emphasis on those branches of mathematics that are important in application- for example, numerical analysis and scientific computing, probability and statistics, and mathematical modeling. The program provides the necessary background for students who wish to apply mathematics in the sciences or in engineering. A large variety of employment opportunities for applied mathematicians exists in the petroleum, chemical, electronics, and other industries, as well as in research organizations. The minor subjects required in this program should be chosen in accordance with the student's interests and career intentions in consultation with a faculty adviser. The program provides a solid foundation for graduate studies in applied mathematics.

Undergraduate Program in Mathematics

Requirements for the B.S. degree are:

A. The General Education Program as described on page 19.

B. Mathematics component: As described in the curriculum that follows.

C. Physical science component: PHYS 203 and CS 200.

D. Minor subject: At least 15 credit hours in a single subject of the student's choice. These courses must be approved by the adviser. All courses must be at the 200 level or higher, and at least nine credit hours at the 300 level or higher. ROTC students may use aerospace studies or naval science courses to satisfy the minor subject requirement.

E. A total of at least 128 credit hours. Remark: The mathematics and natural science components of the General Education Program are covered by requirements B and C above.

Bachelor of Science Curriculum

First

MATH161	5	0	5
CS105	2	1	2
ENGL101*	3	0	3
CS113	0	2	1
Science Elective	3	0	3
Totals	13	3	14

Third Semester

MATH251	4	0	4
MATH332	3	0	3
PHYS104	3	3	4
Free Elective	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	16	3	17

Fifth Semester

MATH461	3	0	3
MATH475	3	0	3
MATH400	3	0	3
Minor Subject	3	0	3

Humanities or Social Sciences Elective*	3	0	3
Totals	15	0	15

Seventh Semester

MATH402	3	0	3
MATH486	3	0	3
Math Elective	3	0	3
Minor Subject	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Free Elective	3	0	3
Totals	18	0	18

Second

MATH162	5	0	5
PHYS103	3	0	3
CS200	3	2	3
HUM 100-level course*	**3**	**0**	**3**
Totals	14	2	14

Fourth Semester

MATH252	4	0	4
MATH370	3	0	3
PHYS203	3	3	4
Minor Subject	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	16	3	17

Sixth Semester

MATH470	3	0	3
MATH476	3	0	3
MATH Elective	3	0	3
Minor Subject	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	15	0	15

Eighth Semester

MATH487	3	0	3
MATH488	3	0	3
Math Elective	3	0	3
Minor Subject	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Free Elective	3	0	3
Totals	18	0	18
Total Credit Hours			**128**

* Humanities and social sciences components of the General Education Program (see page 19 for details).

Bachelor Of Arts Concentration In Mathematics

This program, while still covering the fundamentals in each major area of mathematics, allows more latitude to those students who desire a wider background in various disciplines. The requirements are:

A. The B.A. program as described on page 22.

B. Mathematics component: (i) MATH 151, 152, or MATH 161, 162; (ii) MATH 251, 252, 332, 370, 475; and (iii) at least 15 additional credit hours of mathematics at the 400 level, chosen by the student with the approval of the adviser.

C. Minor components: Two minor sequences (Minor A and Minor B) are required, each in a single discipline. The student chooses the courses in each field in consultation with the B.A. adviser so that they form a coherent body; if need be, an adviser in the minor fields will be assigned. Minor A must cover between 15 and 25 credit hours, while Minor B must cover between 15 and 20 credit hours.

Remark:The mathematics component of the General Education program is covered by requirement B above.

Course Descriptions

* This course does not count for graduation in any engineering or science degree program.

***MATH 100,Pre-Calculus Mathematics**
Combining and simplifying rational expressions. Solving equations and inequalities. Word problems. Exponents and radicals. The coordinate plane; elementary analytic geometry. Credit may not be granted for both MATH 100 and MATH 110, 121, or 141. (4-0-4)

***MATH 120,College Algebra**
Fundamental concepts, exponents, polynomicals, equations, inequalities, and functions. Credit may not be granted for both MATH 120 and MATH 100, 121, or 141. (3-0-3)

***MATH 121,Introduction to Mathematics I**
Fundamental concepts, equations, inequalities, functions. Elementary analytic geometry and trigonometry. Credit may not be granted for both MATH 121 and MATH 100, 110, or 141. (3-0-3)

***MATH 122,Introduction to Mathematics II**
Basic concepts of calculus of a single variable; limits, derivatives, integrals, and applications. Credit may not be granted for both MATH 122 and MATH 142. Prerequisite: MATH 121. (3-0-3)*MATH 141,Mathematical Analysis for Business I

Real numbers, sets and functions, mathematics for finance, equations and graphs, systems of linear equations. Credit may not be granted for both MATH 141 and MATH 100, 110, or 121. (3-0-3)

***MATH 142,Mathematical Analysis for Business II**
Vectors and matrices, systems of linear inequalities. Differential and integral calculus. Credit may not be granted for both MATH 142 and MATH 122. Prerequisite: MATH 141. (3-0-3)

***MATH 150,Functions and Graphs**
Polynomial, rational, and root functions. Trigonometric, exponential, and logarithmic functions. Graphing techniques, analytic geometry. Prerequisite: Placement. (4-0-4)

MATH 151,Calculus I
Analytic geometry. Functions and their graphs. Limits and continuity. Derivatives of algebraic and trigonometric functions. Applications of the derivative. Introduction to integrals and their applications. Prerequisite: MATH 150 or placement. (4-2-5)

MATH 152,Calculus II
Transcendental functions and their calculus. Integration techniques. Applications of the integral. Indeterminate forms and improper integrals. Polar coordinates. Numerical series and power series expansions. Prerequisite: MATH 151. (4-2-5)

MATH 161,Honors Calculus I
Functions. Limits and continuity. Derivatives of algebraic functions. Implicit differentiation. Applications of the derivative: rates, curve sketching, optimization, approximation. Introduction to integration. Applications of the integral: area, volume, work, hydrostatic pressure. Prerequisite: Placement. (5-0-5)

MATH 162,Honors Calculus II
Calculus of transcendental functions: trigonometric, inverse trig., logarithmic, exponential, hyperbolic. Integration techniques. Applications of the integral: arc length, surface area, moments. Indeterminate forms and improper integrals. Parametric equations. Polar coordinates. Numerical series. Power series expansions. Prerequisite: MATH 161 or consent of department. (5-0-5)

***MATH 221,Basic Probability and Statistics**
Introduction to probability and statistics for students in the natural and social sciences or humanities; no calculus background required. Same as MSC 221. (3-0-3)

MATH 251,Multivariate and Vector Calculus
Analytic geometry in three-dimensional space. Partial derivatives. Multiple integrals. Vector analysis. Applications. Prerequisite: MATH 152 or 162. (4-0-4)

MATH 252,Introduction to Differential Equations
Differential equations (ODEs) of order one. Linear ODEs of higher order. Systems of linear ODEs. Laplace transforms. Series solutions of ODEs. Special equations: Bessel, Legendre, etc. Applications. Prerequisite: MATH 152 or 162. (4-0-4)

MATH 331,Mathematical Methods
Matrices; matrix operations, transpose, rank, inverse. Determinants. Solutions of linear equations. Eigenvalues and eigenvectors. Fourier series; half-range series. Applications of solution to potential, wave, and heat equations. Note: Not applicable to B.S. in Mathematics. Prerequisites: MATH 251 and 252. Credit not granted for both MATH 331 and 333. (3-0-3)

MATH 332,Matrices
Matrix algebra, rank, inverses; systems of linear equations, determinants; eigenvalues and eigenvectors. Corequisite: MATH 251. (3-0-3)

MATH 333,Matrix Algebra and Complex Variables
Vectors and matrices; matrix operations, transpose, rank, inverse; determinants; solution of linear systems; eigenvalues and eigenvectors. The complex plane; analytic functions; contour integrals; Laurent series expansions; singularities and residues. Note: Not applicable to B.S. in Mathematics. Prerequisite: MATH 251. Credit not granted for both MATH 331 and 333. (3-0-3)

MATH 370,Numerical Methods
An introduction to the numerical algorithms fundamental to scientific computer work. Includes discussion of error, solution of linear systems, solution of equations by iterative methods, interpolation and approximations, numerical integration and solution of ordinary differential equations. Prerequisite: CS 105. Corequisite: MATH 251. (3-0-3)

MATH 400,Analysis I
Real numbers, continuous functions; differentiation and Riemann integration. Functions defined by series. Prerequisite: MATH 251 or consent of instructor. (3-0-3)

MATH 401,Analysis II
Functions of several variables, partial differentiation, multiple integrals. Prerequisite: MATH 400. (3-0-3)

MATH 402,Complex Analysis
Analytic functions, conformal mapping, contour integration, series expansions, singularities and residues, applications. Intended as a first course in the subject for students in the physical sciences and engineering. Prerequisite: MATH 251. (3-0-3)

MATH 405, Introduction to Iteration and Chaos
Functional iteration and orbits, periodic points and Sharkovsky's cycle theorem, chaos and dynamical systems of dimensions one and two. Julia sets and fractals, physical implications. Prerequisites: MATH 251 and 252 and one of the following: MATH 331, 332, or 333, or consent of the instructor. (3-0-3)

MATH 420,Fourier Analysis
Fourier series, convergence and summability; Fourier integrals. Applications. Prerequisite: MATH 401. (3-0-3)

MATH 430,Algebra
Introduction to groups, rings, fields, vector spaces, polynomials. Prerequisite: MATH 332. (3-0-3)

MATH 440,Number Theory
Prime numbers, congruences, arithmetical functions; quadratic residues; further selected topics. Prerequisite: Consent of instructor. (3-0-3)

MATH 445,Mathematical Logic
Models of languages; propositional, Aristotelian, and predicate logic; formal theories. Prerequisite: CS 330 or consent of instructor. (3-0-3)

MATH 450,Projective Geometry
The projective plane, laws of Desargues and Pappus; introduction of coordinates, analytic projective geometry. Prerequisite: MATH 332. (3-0-3)

MATH 451,Differential Geometry
Theory of curves, the Frenet formulas; theory of surfaces, fundamental forms, curvature; further selected topics. Prerequisite: MATH 251. (3-0-3)

MATH 452,Topology
Fundamentals of point-set topology; metric and topological spaces, study of continuous mappings; further selected topics. Prerequisite: MATH 400. (3-0-3)

MATH 461,Fourier Series and Boundary -Value Problems
Fourier series and integrals. The Laplace, heat, and wave equations: Solutions by separation of variables. D'Alembert's solution of the wave equation. Boundary-value problems. Prerequisites: MATH 251 and 252. (3-0-3)

MATH 470,Numerical Analysis
Finite difference operators, polynomial interpolation, recurrence relations; roots of polynomials, solution of ordinary differential equations; eigenvalues and inverses of matrices, relaxation methods. Prerequisite: MATH 370. (3-0-3)

MATH 474,Introduction to Probability and Statistics
Elementary probability theory; discrete and continuous random variables; joint and conditional distributions. Point estimation, confidence and prediction intervals, hypotheses tests; and linear regression. Prerequisite: MATH 251. Credit not granted for both MATH 474 and 475. (3-0-3)

MATH 475,Probability
Elementary probability theory; combinatorics; random variables; discrete and continuous distributions; joint distributions and moments; transformations and convolution; basic theorems; simulation. Prerequisite: MATH 251. (3-0-3)

MATH 476,Statistics
Estimation theory; hypothesis tests; confidence intervals; goodness-of-fit tests; correlation and linear regression; analysis of variance; nonparametric methods. Prerequisite: MATH 475. (3-0-3)

MATH 482,Introduction to Markov Processes
Random walks, discrete time Markov chains; Poisson processes, continuous time Markov chains; renewal theory. Prerequisite: MATH 475. (3-0-3)

MATH 483,Design and Analysis of Experiments
Principles of estimation; hypothesis tests, confidence intervals. Contingency tables; goodness-of-fit. Analysis of variance; linear regression. Hierarchical and split-plot designs; analysis of covariance. Multiple regression. Prerequisite: MATH 221 or 476. (3-0-3)

MATH 486,Mathematical Modeling I
A general introduction to optimization problems. Linear programming: the simplex method. Elements of graphs and networks. Introduction to game theory. Applications. Prerequisite: MATH 475 or consent of the instructor. (3-0-3)

MATH 487,Mathematical Modeling II
The formulation of mathematical models, solution of mathematical equations, interpretation of results. Case studies from dynamics, fluid mechanics, population dynamics, traffic flow, chemical and biological reactions, etc. Prerequisite: MATH 252. (3-0-3)

MATH 488,Ordinary Differential Equations
Boundary-value problems: Green's functions, Sturm-Liouville theory, eigenfunction expansions. Linear and nonlinear systems: existence and uniqueness, Floquet theory, stability concepts. Phase-plane analysis: critical points, limit cycles. Prerequisite: MATH 252. (3-0-3)

MATH 489,Partial Differential Equations
First-order equations, characteristics. Classification of second-order equations. Laplace's equation: potential theory, Green's function, maximum principles. The wave equation: characteristics, general solution. The heat equation: use of integral transforms. Prerequisite: MATH 461. (3-0-3)

MATH 490,History of Mathematics
A history of mathematics from ancient times to the seventeenth century. (3-0-3)

MATH 491,Reading and Research
(Credit: Variable)

Graduate Courses
The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

MATH 500,Real Analysis I
MATH 510Ordinary Differential Equations

MATH 512,Partial Differential Equations
MATH 514Integral Equations

MATH 526Calculus of Variations
MATH 530Algebra

MATH 532Linear Algebra

MATH 540,Probability
MATH 542Statistics

MATH 555Tensor Analysis
MATH 556Metric Spaces

MATH 564Applied Statistics
MATH 581Theory of Finite Elements

MECHANICAL AND AEROSPACE ENGINEERING

Chairman:Dr. Hassan M. Nagib243 Engineering 1Extension 73175
Professors:Barnett, Corke, Dix, D'Souza, Kalpakjian, Kumar, Nagib (Rettaliata Professor), Nair, Porter, Sciammarella, Tao, Williams
Associate Professors:Acharya, Aronov, Meade, Ruiz, Way
Assistant Professors:Anderson (visiting), Wark
Adjunct Professors:Morel, Patwardhan
Adjunct Associate Professor:Thakkar
Adjunct Assistant Professor:Jennings

Faculty Emeriti:Bonthron, Budenholzer, Cowie, Donnell, Fejer, Graham, Lavan, Morkovin, Rasof, Rettaliata, Torda, Winston

Mechanical engineering is an essential part of nearly every kind of industry and modern technology. Typically, mechanical engineers work in areas such as: the design and control of all types of machinery; the development of means for transportation such as automobiles, aircraft, space and marine vehicles, and railroads; computer-aided design and manufacture of various products, consumer goods, devices, and industrial equipment; medical technology utilizing mechanical and electromechanical devices; the generation of energy from fossil and nuclear fuels; and the utilization, storage, and distribution of alternative energy sources.

Aerospace engineering is concerned with aeronautics, space travel, and space exploration. It comprises such fields as aerodynamics, structures and materials, propulsion systems, and flight mechanics. Aerospace engineers are primarily employed in civil aeronautics, the defense industry, and the space program. However, applications of aerospace technology are also found in related areas such as ground transportation systems, control of air pollution, the effects of wind on buildings and other structures, computers and instrumentation, and composites and other materials.

The department offers the Bachelor of Science in Mechanical Engineering (BSME) and the Bachelor of Science in Aerospace Engineering (BSAE) degrees. Both degree programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The mechanical and aerospace curricula at IIT are based on a strong foundation of courses in the pure sciences and the applied engineering sciences and professional courses in mechanical and aerospace engineering.

Minors available to students who wish to broaden their knowledge are listed beginning on page 28. A student completes a minor by substituting required minor courses for two departmental electives, two technical electives, and one social sciences elective. Among the minors that are available to students in this department are:

Aerospace Engineering* (for ME students only)
Air Force Aerospace Studies**
Construction Management
Design Process
Electromechanical Design and Manufacturing*
Energy and Power/Environment/Economics (E3)
Environmental Engineering
Fire Protection and Safety Engineering

Management
Mechanical Engineering* (for AE students only)
Military Science**
Naval Science**
Probability and Statistics
Product Design**
Software Engineering
* Requires one extra course
** Requires more than one extra course

Other minors may be undertaken with the approval of the student's faculty adviser and the MAE Undergraduate Studies Committee. Application to take a minor is typically made in the student's fourth or fifth semester.

The MAE department considers advising of students an important obligation. Each student must meet with his/her faculty adviser during the preregistration period each semester. Students must closely adhere to course prerequisites to maximize academic performance and satisfy requirements for ABET accreditation. Faculty advisers for all MAE students are listed on a departmental bulletin board.

Undergraduate Programs in Mechanical and Aerospace Engineering

Courses Required for both the BSAE and BSME	**Credit hours**
Mathematics:	
MATH151, 152, 251, 252, 331	21
Physics:	
PHYS103, 104, 207, 208	12
Chemistry:	
CHEM124	4
Science Elective:	
MS101 or CHEM126	3
Computer Science:	
CS105	2
Engineering Graphics:	
EG105	2
Mechanics:	
MECH201, 202, 203, 3051	2
Metallurgical and Materials Engineering:	
METM326	3
Electrical and Computer Engineering:	
EE386	4
Mechanical and Aerospace Engineering:	
MAE111, 112, 205, 301, 306, 307, 310, 401, 402	19
Technical Electives:	
Two courses	6
Humanities and Social Sciences:	
ENGL101, HUM100-level course	6
Humanities Electives (300-level and above)	6
Social Sciences Electives (6 hours at 300-level and above)	12

Additional Courses Required for the BSME	
Mechanical and Aerospace Engineering:	
MAE308, 315, 403, 404, 405, 461, 479	19
ME Electives:	
MAE413 or MAE422	3
MAE480 or MAE481	3
Total Credit Hours, BSME	137

Additional Courses Required for the BSAE	
Mechanical and Aerospace Engineering:	
MAE304, 330, 339, 439, 440, 441, 442	20
AE Electives:	
MAE479 or MAE481	3
MAE413 or MAE443	3
Total Credit Hours, BSAE13	8

Bachelor of Science Curricula

Curricula for both the BSME and the BSAE are the same in the first two years.

First

MATH151	4	2	5
CHEM124	3	3	4
MAE111	0	2	1
CS105	2	1	2
ENGL101**	3	0	3
Social Sciences Elective**	3	0	3
Totals	15	8	18

Third Semester

MATH251	4	0	4
PHYS104	3	3	4
MECH201	3	0	3
Social Sciences Elective**	3	0	3
Social Sciences Elective**	3	0	3
Totals	16	3	17

Second

MATH152	4	2	5
PHYS103	3	0	3
MAE112	0	2	1
Science Elective*	3	0	3
EG105122			
HUM100-level Course**	3	0	3
Totals	14	6	17

Fourth Semester

MATH252	4	0	4
PHYS207	3	0	3
MECH202	3	0	3
MECH203	3	0	3
MAE205	3	0	3
Totals	16	0	16

Mechanical Engineering: Junior and Senior Years

Fifth

MATH331	3	0	3
MECH305	3	0	3
MAE301	3	0	3
MAE306	0	3	1
METM326	3	0	3
EE386	4	0	4
Totals	16	3	17

Seventh Semester

MAE401	2	3	3
MAE403	2	3	3
MAE461	3	0	3
MAE479	3	0	3
ME Elective***	3	0	3
Humanities Elective**	3	0	3
Totals	16	6	18

Sixth

PHYS208	1	3	2
MAE307	0	3	1
MAE308	3	0	3
MAE310	3	0	3
MAE315	3	0	3
Technical Elective	3	0	3
Humanities Elective**	3	0	3

Totals	16	6	18

Eighth Semester

MAE402	1	6	3
MAE404	0	6	2
MAE405	1	3	2
Technical Elective	3	0	3
ME Elective***	3	0	3
Social Sciences Elective**	3	0	3
Totals	11	15	16
Total credit hours			137

Aerospace Engineering: Junior and Senior Years

Fifth

MATH331	3	0	3
MECH305	3	0	3
MAE301	3	0	3
MAE306	0	3	1
METM326	3	0	3
EE386	4	0	4
Totals	16	3	17

Seventh Semester

MAE401	2	3	3
MAE439	3	0	3
MAE440	3	0	3
MAE441	2	3	3
AE Elective#	3	0	3
Humanities Elective**	3	0	3
Totals	16	6	18

Sixth

PHYS208	1	3	2
MAE304	3	0	3
MAE307	0	3	1
MAE310	3	0	3
MAE330	3	0	3
MAE339	3	0	3
Humanities Elective**	3	0	3
Totals	16	6	18

Eighth Semester

MAE402	1	6	3
MAE442	1	3	2
Technical Elective	3	0	3
Technical Elective	3	0	3
AE Elective#	3	0	3
Social Sciences Elective**	3	0	3
Totals	14	9	17
Total credit hours			138

* Science Elective must be chosen from MS101 or CHEM126.

** Humanities and social sciences components of the General Education Requirements (see page 19).

*** One ME Elective must be selected from group A and the other from group B:

Group A: MAE413 or MAE422Group B: MAE480 or MAE481

In general, a technical elective is a 300 or higher level course in any engineering discipline (other than required MAE courses or their equivalent) or in mathematics, physics, or computer science. However, not all such courses are acceptable as technical electives. See your faculty adviser for a determination of which courses are acceptable. In addition, EE228 and ECON423 are permitted. Any deviations require written approval by both the faculty adviser and the chairman of the department.

One AE Elective must be selected from group I and the other from group II:
Group I: MAE479 or MAE481Group II: MAE413 or MAE443

Mechanics Courses

MECH 200,Introduction to Mechanics
Equilibrium concepts. Statics of a particle. Statics of a system of particles and rigid bodies. Distributed forces, centroids and center of gravity. Friction. Kinematics of particles: Newton's laws of motion, energy, momentum. Systems of particles. Dynamics of rotating bodies. Credit for this course is not applicable to the BSME or BSAE programs. Prerequisites: PHYS 103, MATH 152, CS105. Corequisite: MATH 252. (3-0-3)

MECH 201,Statics
Equilibrium concepts. Statics of a particle. Statics of a system of particles and rigid bodies. Distributed forces, centroids, and centers of gravity. Forces in frames, structures, beams, and cables. Friction. Moments of inertia. Prerequisites: CS105, MAE112, PHYS 103, MATH 152. (3-0-3)

MECH 202,Dynamics
Kinematics of particles. Kinetics of particles: Newton's laws of motion, energy, momentum. Systems of particles. Kinematics of rigid bodies. Plane motion of rigid bodies: forces and accelerations, energy, momentum. Prerequisite: MECH 201. Corequisite: MATH 252. (3-0-3)

MECH 203,Mechanics of Solids
Stress and strain relations, mechanical properties, torsion of circular shafts, shear and bending moment diagrams, elementary bending theory, compound stresses, plane stress and strain. Mohr's circle, combined stresses, yield criteria, beam deflection. Prerequisite: MECH 201. (3-0-3)

MECH 305,Fluid Mechanics
Basic properties of fluids in motion. Lagrangian and Eulerian viewpoints, material derivative, streamlines, etc. Continuity, energy and linear and angular momentum equations in integral and differential forms. Integration of equations for one-dimensional flows and application to problems. Incompressible viscous flow; potential flow; Navier-Stokes equations, parallel flow, pipe flow, and the Moody diagram. Introduction to laminar and turbulent boundary layers. Prerequisites: MECH 202, MATH 251, 252, MAE 205. (3-0-3)

Mechanical and Aerospace Engineering Course

MAE 111,Computers in Engineering I
Introduction to engineering. Introduction to PC software, including word processing, spreadsheets, graphics, data communications and database programs. (Same as CS111.) (2-0-1)

MAE 112,Computers in Engineering II
A continuation of MAE 111. Application of PC software to engineering problems with emphasis on numerical methods and statistical techniques. (Same as CS112.) Prerequisite: MAE 111. (2-0-1)

MAE 205,Thermodynamics
Thermodynamic concepts: properties; the first and second laws. Energy analysis of thermodynamic systems, flowing and nonflowing, including power and refrigeration systems.

Second law limitations. Maximum work. Prerequisites: CHEM 124, CS 105, MAE 112, PHYS 104, MATH 251. Corequisite: MATH 252. (3-0-3)

MAE 301,Applied Thermodynamics
Second law analysis of engineering systems. Chemical equilibrium. Thermodynamics of nonreacting systems. Water-air mixtures. Phase diagrams. Thermodynamics of reacting systems. Combustion. Fuel cells. Analysis and design of refrigeration and power generation systems. Prerequisite: MAE 205. (3-0-3)

MAE 304,Mechanics of Aerostructures
Loads on aircraft and flight envelope. Stress, strain, and constitutive relations. Torsion of open, closed, and multi-cell tubes. Bending of multi-cell tubes. Energy methods. Castigliano's theorems. Structural instability. Prerequisites: MECH 203, MATH 251, 252. (3-0-3)

MAE 306,Solid Mechanics / Manufacturing Laboratory
Introduction to measurements of basic mechanical properties of solid materials and the design and manufacturing of parts. Topics include: determination of stress, strain, and the stress-strain response of materials to failure; uniaxial tension, compression, torsion, and flexure; the mechanical response of simple structural elements; selected topics in computer-aided design and manufacturing. Laboratory experiments in small groups supplemented by demonstrations and films. Prerequisite: MECH 203. (0-3-1)

MAE 307,Fluids / Thermal Sciences Laboratory
Introduction to measurements of fluid properties, basic features of fluid flows, thermodynamic and heat transfer processes; flow through pipes and channels; flow-induced forces on bodies; performance of fluid machinery; combustion; thermodynamic cycles; conduction, convection, and radiation heat transfer. Laboratory experiments in small groups supplemented by demonstrations and films. Corequisites: MAE 301, MAE 310. (0-3-1)

MAE 308,Mechanics of Solids and Design
Interrelationships between stress, strength and design. Failure under combined stresses, yielding, stress and strain fields. Fatigue, endurance limits, cumulative damage; design against fatigue. Analysis and design of plates, thin and thick-walled cylinders. Stress concentration factors. Fracture, stress intensity factors. Design charts and applications. Properties and applications of light-weight alloys and composites; design considerations. Prerequisites: MATH 251, 252, METM 326. (3-0-3)

MAE 310,Heat and Mass Transfer
Basic laws of transport phenomena. Similarity relations and analogies. Steady-state heat conduction; heat generation and extended surfaces. Multidimensional and transient heat conduction. Numerical and graphical analysis. Fundamentals and empirical relations of forced and natural convection. Radiation concepts, networks, solar energy. Combined effects. Electrical analogies. Prerequisites: MATH 331, MECH 305. (3-0-3)

MAE 315,Introduction to Systems Dynamics
Description of mechanical and electrical systems using ordinary differential equations. Linearization techniques. Dynamic response and stability. Numerical techniques for solving system models. Prerequisite: MECH 202. Corequisite: EE 386. (3-0-3)

MAE 330,Compressible Flow
Regimes of compressible perfect-gas flow. Steady, quasi one-dimensional flow in passages. Effects of heat addition and friction in ducts. Design of nozzles, diffusers, and wind tunnels. Simple waves and shocks in unsteady duct flow. Steady two-dimensional supersonic flow including oblique shocks and Prandtl-Meyer expansions. Prerequisites: MECH 305, MAE 301. (3-0-3)

MAE 339,Aerodynamics of Aerospace Vehicles
Analysis of aerodynamic lift and drag forces on bodies. Potential flow calculation of lift on two-dimensional bodies; numerical solutions; source and vortex panels. Boundary layers and drag calculations. Aerodynamic characteristics of airfoils; the finite wing. Prerequisites: MECH 305, MAE 301, MATH 331. (3-0-3)

MAE 401,Measurement Systems:: Application and Design
Introduction to types of applications of measurement instrumentation. Generalized configurations and functional descriptions of measuring instruments. Operational amplifiers and analog signal processing. Measurement of motion, force, strain, torque, shaft power, pressure, sound, flow, temperature, and heat flux. Prerequisite: MAE 310. Corequisite: EE 386. (2-2-3)

MAE 402,Engineering Experiments:: Analysis and Design
Application of the fundamental principles of dynamics, thermodynamics, fluid mechanics, heat transfer, and electricity to the design and analysis of experiments. Individual experimental design research projects selected from areas involving supersonic gas flow, heat transfer and combustion, vibrations, or other areas of student interest. Some topics especially designated for aerospace engineering students. Prerequisite: MAE 401. (1-6-3)

MAE 403,Design of Machine Elements
Design factors and fatigue. Application of principles of mechanics to the design of various machine elements such as gears, bearings, clutches, brakes, and springs. Prerequisite: MAE 308. (2-2-3)

MAE 404,Design of Mechanical Systems
Small group design projects drawn from industry. Prerequisite: MAE 403. (0-6-2)

MAE 405,Design of Thermal Systems
Application of principles of fluid mechanics, heat transfer, and thermodynamics to design of components and engineering systems. Examples are drawn from power generation, environmental control, air and ground transportation, and industrial processes, as well as other industries. Groups of students work on projects for integration of these components and design of thermal systems. Prerequisites: MAE 301, 310. (1-3-2)

MAE 406,Design for Mechanical Reliability
Reliability and hazard functions; static and dynamic reliability models for series, parallel and complex systems; reliability allocation. Probabilistic design; stress and strength distributions; safety factors; loading random variables; component geometry as random variable; geometric tolerances, linear and nonlinear dimensional combinations; stress as random variable; material properties as random variables; failure theories; significant stress-strength models; reliability confidence intervals. Prerequisite: MAE 403. (3-0-3)

MAE 413,Mechanical Vibrations
Study of free, forced, and damped vibrations of single degree of freedom mechanical systems: resonance, critical damping, vibration isolation. Two degree of freedom systems: natural frequencies, normal modes, resonances, vibration absorbers. Introduction to vibrations of multiple degree of freedom systems. Prerequisite: MECH 202, MATH 331. (3-0-3)

MAE 414,Introduction to Robotics
Classification of robots; kinematics and inverse kinematics of manipulators; trajectory planning; robot dynamics and equations of motion; position control. Prerequisite: MAE 315. (3-0-3)

MAE 419,Design for Safety in Machines
A critical study of the interface between law and safety engineering, which embraces not only statutory law, such as OSHA and the Consumer Products Safety Act, but also case law arising out

of product liability suits. Detailed analysis of actual industrial and consumer accidents from the investigative stages through their litigation. Formulation of general safety design techniques for mechanical engineering systems and the development of courtroom skills for expert witnesses. Prerequisite: Senior standing. (3-0-3)

MAE 422,Finite Element Methods in Engineering
Principles of minimum potential energy for structures_stiffness matrices, stress matrices, and assembly process of global matrices. The finite element method for two-dimensional problems_interpolation functions, area coordinates, isoparametric elements, problems of stress concentration. General finite element codes_data generation and checks, ill-conditioned problems, node numbering. Prerequisites: MAE 304 or 308. (3-0-3)

MAE 426,High-Speed Ground Transportation
Elements of rail transportation, resistance, power and high speed requirements. Modern high speed rail systems--TGV, Shin Kan Sen and others. Magnetic levitation and other high speed systems. Guideway and track considerations. Mechanics and comparative study of various systems. Stability, efficiency and special features. Prerequisite: MECH 202. (3-0-3)

MAE 439,Aerospace Propulsion
Analysis and performance of various jet and rocket propulsive devices. Foundations of propulsion theory. Design and analysis of inlets, compressors, combustion chambers and other elements of propulsive devices. Emphasis is placed on mobile power plants for aerospace applications. Prerequisites: MAE 330, 339. (3-0-3)

MAE 440,Spacecraft and Aircraft Dynamics
Two-body central force motion, orbital dynamics and orbital maneuvers. Rigid body kinematics, Euler angles, dynamics, and attitude reorientation of spacecraft. Aircraft equations of motion; longitudinal and lateral stability. Design of aircraft components for stability. Prerequisite: MAE 339. (3-0-3)

MAE 441,Design of Aerospace Vehicles I
Aircraft design including aerodynamic, structural, and powerplant characteristics to achieve performance goals. Focus on applications ranging from commercial to military, from manpowered to high-speed to long-duration aircraft. Semester project is a collaborative effort in which small design groups complete the preliminary design cycle of an aircraft to achieve specific design requirements. Prerequisites: MAE 304, 330, 339. (2-3-3)

MAE 442,Design of Aerospace Vehicles II
Design of spacecraft systems including mission profile, booster characteristics, interplanetary astrodynamics, communications, sensor systems, power distribution,

thermal management, spacecraft dynamics, and life-cycle cost. Semester-long project is focussed on the integration of multiple systems into a coherent spacecraft design. Extensive use of computer graphics and design software. Prerequisites: MAE 439, 440, 441. (1-3-2)

MAE 443,Aircraft and Spacecraft Response and Control
Aircraft lateral modes of motion and approximations; the yaw damper. Aircraft response to control and external inputs; introduction to automatic control. Spacecraft attitude control devices_gyroscopic instruments, momentum exchange and mass movement techniques, gravity gradient stabilization. Introduction to spacecraft automatic attitude control systems. Prerequisite: MAE 440. (3-0-3)

MAE 450,Direct Energy Conversion
A study of various methods available for the direct conversion of thermal energy into electrical energy. Introduction to the principles of operation of magnetohydrodynamic generators,

thermoelectric devices, thermionic converters, fuel cells, and solar cells. Prerequisites: MAE 301, PHYS 208. (3-0-3)

MAE 452,Air Conditioning and Refrigeration
Environmental control for winter and summer; elements of psychrometrics; load calculations. Space heating and cooling methods; extended surface coils; solar shading techniques for summer and winter. Absorption refrigeration. System analysis and planning. Prerequisites: MAE 301, 310. (3-0-3)

MAE 453,Combustion Theory and Application
Introduction to combustion theories. Combustion reactions, dissociation, vaporization, and ignition. Determination of combustion efficiency, heating values, and other variables. Gaseous, liquid, and solid fuels. Combustion applications to heating equipment, internal combustion engines, and propulsion systems. Prerequisites: MAE 301, 310. (3-0-3)

MAE 454,Internal Combustion Engines
Fundamentals of spark ignition and diesel engines. Combustion knock and engine variables, exhaust gas analysis and air pollution, carburetion, fuel injection, lubrication, engine performance, vehicle performance. Engine balance and vibrations. Electronic control. Prerequisite: MAE 301, MAE 310. (3-0-3)

MAE 461,Systems Analysis and Control
Mathematical modeling of lumped-parameter dynamical systems. Linearization techniques. Laplace transformations and transfer functions. Transient and frequency response. Stability theory. Control of single-input, single-output systems. Types of controllers and their design employing root-locus. Design of state feedback controllers. Pole placement and state observer design. Prerequisite: MAE 315. (3-0-3)

MAE 475,Biomechanics:: Solids
Properties of mathematical models for bone, soft tissues, tendons, ligaments, cartilage, and muscles. Human body structure, posture, movement, and locomotion. Spine mechanics and joint mechanics. Mechanics of occlusion and mastication. Exo- and Endo-prosthetics. Implants and biomechanical compatibility. Prerequisites: MAE 308 and consent of instructor. Corequisite: MAE 401. (3-0-3)

MAE 479,Materials Processing
Principles of material forming and removal processes and equipment. Force and power requirements, surface integrity, final properties, dimensional accuracy as influenced by material properties and process variables. Design for manufacturing. Factors influencing choice of manufacturing process. Prerequisite: METM 326. (3-0-3)

MAE 480,Manufacturing Processes and Machinery
Analysis of basic manufacturing processes, with emphasis on secondary and finishing operations. Casting, powder metallurgy, processing of polymers and composite materials, and quality assurance. The material / design / manufacturing interface. Competitive aspects and modern trends in manufacturing and computer-integrated machinery. Prerequisite: MAE 479 or equivalent. (3-0-3)

MAE 481,CAD/CAM with Numerical Control
Computer graphics for engineering design and analysis of CAD software and hardware. Numerical control of machine tools by various methods. Prerequisites: CS 105, MATH 252. (3-0-3)

MAE 482,Gear Design
Geometry and analysis of spur, worm, spiral, bevel, and helical gears and their applications. Software for gear design. Gear wear and failures. Prerequisite: Senior standing or consent of instructor. (3-0-3)

MAE 483,Gear Manufacture
Methods of gear manufacture: forging, rolling, casting, powder metallurgy, machining (form cutting and gear generating). Finishing processes and heat treatment. Design considerations. Characteristics of gear manufacturing machinery, gear quality, economics, and competitive aspects. Prerequisite: Senior standing or consent of instructor. (3-0-3)

MAE 491,Undergraduate Research
Student undertakes an independent research project under the guidance of a faculty member. Requires the approval of the MAE Department Undergraduate Studies Committee. (Credit: Variable. 3 hours maximum.)

MAE 494,Undergraduate Design Project
Student undertakes an independent design project under the guidance of a faculty member. Requires the approval of the MAE Department Undergraduate Studies Committee. (Credit: Variable. 3 hours maximum.)

MAE 497,Undergraduate Special Topics
(Credit: Variable.)

Graduate Courses
Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

MEDICAL STUDIES

Chairman, Health Professions Advisory Committee:Dr. Robert Roth206 Life SciencesExtension 73480

IIT provides excellent preparation for students planning to attend medical or dental school. By majoring in such fields as biology, chemistry, engineering, mathematics, or psychology, students can fulfill professional school prerequisites. The Health Professions Advisory Committee supervises premedical and predental curricula. Each premedical and predental student is assigned a health professions adviser, as well as a department adviser. The committee and advisers assist students in selecting appropriate courses and in applying to medical and dental school. Students interested in information about medicine, pharmacy, dentistry, osteopathy, or optometry should contact the health professions committee chairman.

For information on IIT's accelerated honors program in engineering and medicine, see page 26.
Sample Curriculum*

First			
BIOL107	3	0	3
BIOL109	1	4	3
CHEM124	3	3	4
ENGL101**	3	0	3
Social Sciences Elective**	3	0	3
CHEM113	0	2	1
Totals	13	9	17
Third Semester			
BIOL430	3	0	3
Humanities Elective**	3	0	3
CHEM237	3	4	4
MATH151	4	2	5
CS105	2	1	2
Totals	15	7	17
Second			
BIOL114	0	2	1
BIOL115	3	0	3
BIOL116	1	4	3
CHEM125	3	3	4
HUM100-level course**	3	0	3
Social Sciences Elective**	3	0	3
Totals	13	9	17
Fourth Semester			
CHEM239	3	0	3
MATH152	4	2	5
PHYS103	3	0	3
PSYC201	3	0	3
Social Sciences Elective**	3	0	3
Totals	16	2	17
Fifth Semester			
CHEM243	4	0	4
Humanities Elective**	3	0	3
PHYS104	3	3	4
Major Sequence, Supportive, or Elective Courses	6	0	6
Totals	16	3	17
Seventh Semester			
Elective	3	0	3

Major Sequence, Supportive,or Elective Courses	14	0	14
Totals	17	0	17

Sixth

CHEM244	3	0	3
CHEM247	2	4	3
Humanities Elective**	3	0	3
Major Sequence, Supportive, or Elective Courses	9	0	9
Totals	17	4	18

Eighth Semester

Major Sequence, Supportive, or Elective Courses	15	0	15
Totals	15	0	15

* Hours and courses may vary depending on major.

** Humanities and social sciences components of the General Education Program (see page 19 for details).

ROTC students may use aerospace studies or naval science courses as approved electives.

Depending on level of preparation students may begin with MATH 110 and may select the MATH 121-122 sequence.

Students may substitute PHYS 211 and 212.

By the fifth semester students must choose a specific major for their degree; the remainder of the program must be approved by the major department.

Post-Baccalaureate Pre-Medical Program

This program prepares college graduates for application and admission to medical school. In many cases post-baccalaureate students were not pre-meds in college and took few, if any, pre-medical science courses. In other cases post-baccalaureate students have been out of school for awhile and wish to refresh their knowledge, improve their grade point averages, or prepare for the Medical College Admission Test (MCAT). Students in the program have complete access to course, faculty advising, minority student services, and campus facilities. Post-baccalaureate students are advised by the IIT pre-medical adviser and the Pre-Health Professions Advisory Committee. The program is available for both full-time and part-time enrollment. Students in the program enroll in regular courses along with other IIT students. IIT has an excellent record of preparing students for admission and success in medical, dental, and veterinary schools.

METALLURGICAL AND MATERIALS ENGINEERING

Chairman: Dr. John S. Kallend 207 Perlstein Hall Extension 73050
Professors: Copley, Higgins, Kallend, Nash
Associate Professors: Dollar, Mostovoy, Todd
Research Professor: Broutman
Adjunct Professors: Routbort, Singh
Faculty Emeritus: Breyer, Gordon

The development and continued advance of civilization depends on the availability of materials whose properties make them suitable for the construction of machines, structures, and devices. Metallurgical and materials engineering is a discipline whose purpose is the development of new materials and the improvement of existing materials to meet the ever more stringent demands of society. The scope of the subject is extremely broad, covering as it does the extraction, processing, application, and economics of such diverse materials as structural metals and alloys, ceramics, semiconductors, polymers, and composites.

The B.S. Metallurgical Engineering curriculum at IIT is solidly based on fundamental courses in pure and engineering science, and professional courses in various specialized topics and applications of the field. Laboratory experience is an important part of the program and emphasizes mechanical testing, X-ray diffraction, and electron and optical microscopy. The graduate in metallurgical engineering is, therefore, well prepared either to go directly into industry, or to pursue graduate study aimed at a career in research, teaching, or industry.

Students may choose a professional specialization in Manufacturing and Processing of Materials or Materials Science as described on the following pages, or one of the following minors (see page 28):

Air Force Aerospace Studies
Applied Solid State Physics
Industrial Engineering
Management for Non-Business Majors
Military Science
Naval Science

Metallurgical Engineering

Required Core Major Courses	**Credit Hours**
METM 111, 112, 220, 301, 305, 318, 321, 326, 328, 423, 424, 425, 427, 480, 494, MS 1014	5
Electives	5
Mathematics Requirements	
MATH 151, 152, 251, 252	**18**
Physics Requirements	
PHYS 103, 104, 203	**11**
Chemistry Requirements	
CHEM 124, 125	**8**
Computer Science Requirement	
CS 105	**2**
Engineering Course Requirements	
EE 383, EG 105, MECH 201, 202, 203	**14**
Humanities and Social Sciences Requirements	
ENGL 101, HUM 100-level	**6**
Humanities Electives (300-level and above)	6
Social Science Electives (6 hours 300-level+)	12

Electives	
Science Elective (300-level)	3
Technical Electives	6
Total Credit Hours	**136**

Curriculum

First Semester	**Lect**	**Lab**	**Cred. Hrs**
MATH151	4	2	5
CHEM124	3	3	4
CS105	2	1	2
METM111	0	2	1
ENGL101*	3	0	3
Social Sciences Elective*	3	0	3
Totals	15	8	18
Second Semester			
MATH152	4	2	5
MS101	3	0	3
EG105	1	2	2
METM112	0	2	1
HUM 100-level course*	3	0	3
PHYS103	3	0	3
Totals	14	6	17
Third Semester			
METM220	1	6	3
MATH251	4	0	4
PHYS104	3	3	4
MECH201	3	0	3
Social Sciences Elective*	3	0	3
Totals	14	9	17
Fourth Semester			
PHYS203	3	3	4
MECH202	3	0	3
MECH203	3	0	3
CHEM125	3	3	4
Humanities Elective*	3	0	3
Totals	15	6	17
Fifth Semester			
METM305	3	0	3
METM318	4	0	4
METM326	3	0	3
MATH252	4	0	4
Humanities Elective*	3	0	3
Totals	17	0	17
Sixth Semester			
METM301	3	0	3
METM 321	1	6	3
METM328	3	0	3
EE383	3	0	3
Science Elective (300 level)	3	0	3
Social Sciences Elective*	3	0	3
Totals	16	6	18
Seventh Semester			
METM Elective**	1	3	2
METM423	2	3	3

METM427	3	0	3
METM480	3	0	3
METM494	1	6	3
Social Sciences Elective*	3	0	3
Totals	13	12	17

Eighth Semester

METM Elective**	3	0	3
METM424	2	3	3
METM425	2	3	3
Technical Electives**	6	0	6
Totals	13	6	15
Total Credit Hours			**136**

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

*Humanities and social sciences components of the General Education Program (see page 19 for details).

**In selecting electives, students are required to take a minimum of two design courses designated with a letter D in this Bulletin.

Professional Specializations Materials and Processing of Materials
This professional specialization consists of 15 credit hours selected from:

*METM 402 -- Ferrous Technology

METM 403 -- Corrosion
METM 413 -- Powder Metallurgy

METM 416 -- Powder Materials Laboratory
METM 428 -- Commercial Alloys

METM 430 -- Service Failure Analysis
METM 446 -- Forging

METM 461 -- Welding & Fabrication
METM 481 -- Composite Materials

*MAE 480 -- Manufacturing Processes and Machinery
*MATH 475 -- Probability
*MATH 476 -- Statistics
*OM 423 -- Operations Systems Design
*OM 425 -- Simulation of Operation Systems
*CHE 455 -- Polymer Processing
*CHE 465 -- Electrochemical Energy Conversion

Materials Science
This professional specialization consists of 15 credit hours selected from:

*METM 403 -- Corrosion
METM 405 -- Diffraction and Microscopy
METM 413 -- Powder Metallurgy
METM 440 -- Computer Applications in Materials Science and Engineering
*METM 435 -- Electrical, Optical, and Magnetic Properties
METM 468 -- Advanced Metallographic Techniques
METM 483 -- Structure and Properties of Polymers
METM 485 -- Introduction to CeramicMaterials
*CHEM 243 -- Physical Chemistry I
*CHEM 244 -- Physical Chemistry II
*PHYS 348 -- Modern Physics for Scientists and Engineers

*PHYS 412 -- Modern Optics and Lasers
*A maximum of two courses in these options.

Other appropriate courses may be included subject to approval by the student's adviser and the chairman of the department.

Metallurgical and Materials Engineering

Course Descriptions
(D) indicates elective design course.

MS 101,Materials Science
Introduction to the science of solid materials. Emphasis is placed on the relations between the structure of materials (on the microscopic and macroscopic levels) and their electrical, thermal, and mechanical properties. Physical, chemical, and processing factors affecting the structure of polymeric, ceramic, metallic, and semiconducting materials are treated. Prerequisite: CHEM 124. (3-0-3)

METM 111,Computers in Engineering I
Introduction to engineering and software of the PC. Typically will include word processing, spreadsheets, graphics, data communications and database software. (Same as CS 111.) (0-2-1)

METM 112,Computers in Engineering II
A continuation of METM 111. Application of PC software to engineering problems with emphasis on numerical methods and statistical techniques. Prerequisite: METM 111. (Same as CS 112.) (0-2-1)

METM 202,Electron Microscopy of Materials
Applications of microscopy in metallurgy and materials science, including electronic materials. Hands-on practice with scanning electron microscopes and energy dispersive analyzers.

Light microscopy, transmission electron microscopy, sample preparation, technical photography, and darkroom experience. Prerequisite: MS 101. (1-3-2)

METM 220,Materials Laboratory I
Basic metallurgy and materials laboratory methods including pyrometry, mechanical testing, metallography (optical and electron), X-ray diffraction, and radiography. Prerequisite: MS 101. (1-6-3)

METM 301,Chemical Metallurgy
Applications of thermodynamics, kinetics, and transport phenomena to metallurgical reactions among solid, liquid, and gas phases. Applications in extractive metallurgy, oxidation, and materials processing. Prerequisite: METM 318. (3-0-3)

METM 305 Physics of Solids
Introduction to crystallography; crystal structure, crystal systems, symmetry, stereographic representation. Crystal structures in materials. X-ray diffraction; character of X-rays and their interaction with crystals, diffraction methods. Structure of the atom and the behavior of electrons in solids. Band theory of solids. Electrical, thermal, and magnetic behavior. Theory of phase stability in alloys. Prerequisite: MS 101. (3-0-3)

METM 318,Metallurgical Thermodynamics
The three laws of thermodynamics. Extensive problem solving in metallurgical applications of heat and mass balances, free energy criteria, and equilibrium relations. Prerequisite: MS 101. (4-0-4)

METM 321,Materials Laboratory II
Continuation of METM 220. Emphasis on applications to phase diagram determination, strengthening reactions, solid-state transformations, deformation and annealing, stress-strain behavior. Prerequisite: METM 220. (1-6-3)

METM 326,Engineering Materials and Design
Physical principles of elastic and plastic deformation of materials. Mechanical testing methods including tensile, hardness, impact, toughness, fatigue, and creep. Mechanical properties of materials as related to microstructure and service conditions. Strengthening mechanisms in single-phase and composite materials. Prerequisites: MS 101 or CHEM 125, and MECH 203. (3-0-3)

METM 328,Physical Metallurgy I
Microstructural development in metals and alloys. The thermodynamic and kinetic principles of phase diagrams, diffusion, solidification, annealing, and solid-state phase transformations. Prerequisites: MS 101 and METM 318. (3-0-3)

METM 400,Metallurgical and Materials Engineering Review
Intensive review of undegraduate metallurgical and materials engineering principles. Intended for graduate students whose backgrounds did not include all the materials fundamentals necessary as preparation for METM graduate study. Prerequisite: Consent of adviser. (4-0-4)

METM 402,Ferrous Technology
Production of ferrous materials in the integrated steel mill, including treatment of the iron blast furnace and steelmaking in the basic oxygen furnace. Processing of the materials in the plant and thermodynamic reaction considerations. Other ferrous processes discussed include gas-metal reactions and surface treatments. Prerequisite: METM 328. (3-0-3) (D)

METM 403, Corrosion
Theory and prevention of corrosion of metals, including oxidation, sulphidation, other atmospheric attacks, aqueous corrosion, and other topics. Prerequisite: METM 328. (3-0-3) (D)

METM 405,Diffraction and Microscopy
Theory of diffraction of X-rays, neutrons, and electrons by crystals. Operation of X-ray diffractometers; X-ray safety. Practical applications of X-ray diffraction in problems in materials engineering. Applications of the transmission electron microscope and the theory of image formation. Prerequisites: METM 305 and METM 328. (2-3-3)

METM 413,Powder Metallurgy
Production, pressing, and sintering of metal powders. Effects of particle size, friction, and die design on pressed densities. Theories of sintering. Relation of sintering practice to physical properties. Homogenization of alloys, industrial equipment. Applications. Prerequisite: METM 328. (3-0-3) (D)

METM 416,Powder Metallurgy Laboratory
Basic techniques of powder materials technology from powder to finished product; manufactured parts such as porous bronze bearings, filters, structural ferrous parts, and ceramic components. Prerequisite: METM 413. (1-6-3) (D)

METM 423,Metal Casting
Melting and alloying procedures, metal-mold reactions, riser and gate design, process optimization, special casting processes. Prerequisite: METM 328. (2-3-3)

METM 424,Plastic Working
The theory and practice of rolling, forging, extruding, and other metal forming processes. Prerequisite: METM 328. (2-3-3)

METM 425,Heat Treatment
Annealing, solution treatments, hardening treatments, tempering, carburizing, and nitriding. Powder metallurgy. Prerequisite: METM 328. (2-3-3)

METM 427,Physical Metallurgy II
Point, line, and planar defects; dislocations and slip phenomena, deformation geometry, strengthening mechanisms, deformation twining and martensitic reactions, creep in pure metals and alloys, fatigue, physical metallurgy aspects of fracture. Prerequisites: METM 326, METM 328. (3-0-3)

METM 428, Commercial Alloys
The characteristics and properties of commercial alloys. Their selection, fabrication, and use. Prerequisite: METM 328. (2-0-2) (D)

METM 430,Service Failure Analysis
Theory and practice of the approaches to the analysis of failures which have occurred in service. Prerequisite: Consent of instructor. (2-3-3) (D)

METM 435,Electrical, Magnetic, and Optical Properties of Materials
Electronic structure of solids. Semiconductor devices and their fabrication. Ferroelectric and piezoelectric materials. Magnetic properties, magnetocrystalline anistropy, magnetic materials and devices. Optical properties and their applications, generation and use of polarized light. Same as EE 435. Prerequisite: EE 311 or METM 305. (3-0-3). (D)

METM 440,Computer Applications in Materials Science and Engineering
Numerical modeling. Thermodynamic modeling of phase equilibria. Laboratory applications involving data acquisition, statistical analysis, and data presentation. Modeling of structure property relationships, image analysis, X-ray, and electron diffraction. Finite element determination of stresses and strains. Modeling of metallurgical processes, such as forging, rolling, and casting. Prerequisite: Consent of instructor. (3-0-3) (D)

METM 446,Forging
Raw materials, fabrication, and other metallurgical aspects of press and drop forgings, including inspection and finishing. Prerequisite: METM 326 or consent of instructor. (2-0-2) (D)

METM 450,Electroplating
Electrochemistry of plating. Plating processes. Efficiency and throwing power. Structure and properties of electrodeposited layers. Prerequisite: METM 318. (2-3-3)

METM 461,Welding and Fabrication
Principles and processes for metal joining by welding, brazing, and soldering. Metallurgy of joining steels, aluminum, and other metals. Industrial applications of welding technology including quality control and specification development. Prerequisite: METM 328. (2-3-3) (D)

METM 468,Advanced Metallographic Techniques
Techniques, procedures, and applications in modern metallography. Optical microscopy; bright field, dark field, and oblique illumination, phase contrast and interference techniques, polarizing microscopy. Quantitative metallography. Scanning electron microscopy and electron probe microanalysis. Transmission electron microscopy. Prerequisites: METM 321 and METM 328. (2-3-3)

METM 480,Introduction to Nonmetallic Materials
Structure and properties of organic polymers. Polymerization methods, chemistry of polymers, and the amorphous and crystalline state; mechanical behavior of polymers and the relation between structure and properties. Fiber reinforced composite materials; emphasis on fabrication technology, fiber properties, and principles of mechanical behavior. Prerequisite: MS 101. (3-0-3)

METM 481,Composite Materials
Structure and methods of preparation of fibers and fiber reinforced composites. Micromechanics of fiber and particle reinforced composites. Prediction of elastic constants and strength, stress analysis, interfacial mechanics, and properties. Prerequisites: MECH 203 and METM 480. (3-0-3) (D)

METM 483,Structure and Properties of Polymers
Molecular structure of amorphous, crystalline, and network polymers. Theories of the glassy state. Transition and melt temperatures. Model predictions of viscoelastic properties. Time-temperature superposition principle. Theory of rubber elasticity. Prerequisite: METM 480. (3-0-3)

METM 485 Introduction to Ceramic Materials
The structure and structure/ properties relationships of ceramic materials. Topics include: crystal structure types, crystal defects, structure of glass, phase equilibria and how these affect applications for mechanical properties, electrical properties, and magnetic properties. Sintering and ceramic reactions are related to microstructure and resultant properties. Prerequisite: MS 101 or equivalent. (3-0-3)

METM 486,Properties of Ceramics
Thermal, optical, mechanical, electrical, and magnetic properties of ceramics and their applications. Includes a review of defect equilibria and ceramic microstructures. Prerequisite: MS 101 or equivalent. (2-3-3)

METM 494,Material Design Project (1 -6-3)

METM 497,Special Problems
Individualized instruction. (Credit: Variable)

Graduate Courses
Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

PHYSICAL EDUCATION AND ATHLETICS

Director: James Darrah Keating Sports Center Extension 73296
Instructors: Haley, Just, Matuch, McQuillan, Meyer, Wozniak

The philosophy of the department is directed toward the embodiment of sensible health practices and the improvement of physical competency.

Lockers will be assigned at the first class meeting. Students must furnish a combination lock. Gym shirts, swim wear, and locks may be purchased at the campus bookstore. Bathing suits and uniforms are required for the second class meeting.

IIT offers a wide range of intercollegiate and intramural athletics. The university is a member of the NAIA. Men's varsity teams are sponsored in baseball, basketball, swimming, cross-country, and volleyball. Women's intercollegiate sports are offered in volleyball, cross-country, swimming, basketball, and softball. Hockey, wrestling, and sailing are offered on a club basis.

All athletes must be regularly enrolled, full-time undergraduates and must maintain scholastic eligibility. Graduates of accredited high schools or junior colleges become eligible to compete in college athletics immediately upon matriculation. A four-year college transfer is ineligible to compete in an NAIA sport for one semester. A limited number of athletic scholarships are available from IIT's Student Finance Center to outstanding scholar-athletes.

An athlete is permitted four full years of intercollegiate competition, which may accumulate at IIT or in a combination IIT and junior college career. Appropriate varsity awards are presented to letter winners in all sports. Seniors who have lettered for four consecutive years in a sport are given an IIT Letterman's watch.

Intramural sports for men and women -- touch football, basketball, softball, tennis, handball, turkey trot, racquetball, cross-country, volleyball, and swimming -- offer spirited competition to students not engaged in varsity competition. A strong interfraternity sports program is supervised by the department.

Recreational activities, open swimming hours, and open free-play activities are all available during structured hours at Keating Sports Center, a modern, multi-level, all-glass gymnasium. Varsity and intramural playing fields adjoin Keating Sports Center.

Course Descriptions

PE 011,Beginning Swimming
Main objective of beginner swim course is to equip individuals with basic water safety skills and knowledge in order to make them reasonably safe while in, on, or about the water. (0-2-0)

PE 012,Intermediate Swimming
Objective of the course is to provide the student with the opportunity to learn the elements of good swimming. (0-2-0)

PE 013,Swimmers Swimming
Objectives are to increase the students' endurance; to improve the students' performance of coordinated strokes; and to teach students new skills that will increase their overall aquatic abilities. (0-2-0)

PE 014,Advanced Swimming
Main objective is to provide student with ability to perform a wide variety of strokes effectively and with good coordination, many of which have been taught in earlier courses. Prerequisite: Ability to swim 200 yards (8 lengths) the first day of class.(0-2-0)

PE 015,Lifesaving Swimming
Teaches the student to prevent accidents both in the water and on the deck or beach area. Also teaches secondary responsibilities in the rescue and emergency care of an accident victim (drowning). Prerequisite: Ability to swim 200 yards (8 lengths) the first day of class. (0-2-0)

PE 021,Badminton
Fundamental strokes, rules, and strategy. (0-1-0)

PE 022,Basketball
Basic skills, rules. (0-1-0)

PE 025,Exercise and Fitness
Introduction to exercises to increase strength and endurance and weight reduction. (0-1-0)

PE 027,Racquetball
Fundamental strokes, rules, and strategy. (0-1-0)

PE 029,Softball
Fundamental rules, hitting technique, fielding, and throwing. (0-1-0)

PE 031,Tennis
Basic strokes, rules, and strategy. (0-1-0)

PE 032,Touch Football
Fundamental skills and rules. (0-1-0)

PE 033,Volleyball
Basic technique of hitting the ball, rules, and strategy. (0-1-0)

PHYSICS

Chairman:Dr. Porter W. Johnson104 Siegel HallExtension 73375
Professors:R. Burnstein, Erber, Grossweiner, P.W. Johnson, Rubin, Spector, Zasadzinski
Associate Professors:Bunker, Longworth, Morrison, Segre
Assistant Professor:Coffey
Faculty Emeriti:Colvert, Hauser, Malhiot, Markham, Zwicker

As the central science, physics has had a profound impact on almost all branches of science and technology. Its areas of investigation include the subnuclear world through the domains of microelectronics, our familiar environment, and even the most distant galaxies. It has provided the microscopic basis for chemistry and stimulated important developments in mathematics and computer science. In addition, physics forms the basis of most branches of engineering, and, during the past decade, has proved to be increasingly valuable to the life sciences.

The regular physics program offers solid preparation in modern as well as classical physics. Because of its emphasis on a broad knowledge of basic physics and mathematics, combined with logical thinking and expression, this program provides graduates with excellent opportunities to pursue a broad spectrum of career choices. Students majoring in physics can go on to graduate studies in physics or physics-based sciences, biophysics, and engineering fields, as well as industrial research and development. For students particularly interested in applied physics, a more sharply focused Applied Physics Program is described. There also is a B.S./M.S. program in medical physics. Students in the interdisciplinary program of Science and Technology in Context (STX) also may develop a specialization in physics.

Most faculty members in the Department of Physics encourage undergraduate student participation in their active research programs. Research is currently being undertaken in the areas of condensed matter physics (superconductivity, semiconductors, and thin films), magnetism, elementary particle physics, radiation biophysics, and medical physics. This research experience gives students a chance to explore forefront areas of science and helps them to carry out projects of their own in pursuit of their professional careers. The research may be undertaken for limited academic credit, substituted for a required laboratory course, or done as a part-time or summer job.

Physics--B.S

Required Core Major Courses	**Credit Hours**
PHYS 113, 103 or 153, 104 or 154, 203 or 253, 240, 300, 304, 308, 309, 348, 405, 406, 413, 414, 427, 428, 440	51
Electives	6
Mathematics Requirements	
MATH 151, 152, 251, 252	18
Electives	6
Chemistry Requirements	
CHEM 124, 125	8
Computer Science Requirement	
CS 105	2
Humanities and Social Sciences Requirements	
ENGL 101, HUM 100-level	6
Humanities Electives (300-level and above)	**6**
Social Science Electives (6 hrs. 300-level)	12
Electives	
Free Electives	12
Total Credit Hours	127

Bachelor of Science Curriculum

First			
CHEM124	3	3	4
CS105	2	1	2
PHYS113	0	2	1
ENGL101**	3	0	3
MATH	1	5	1
or			
MATH161	4	2	5
PHYS103*			
or			
PHYS153	3	0	3
Totals	15	8	18
Third Semester			
MATH251	4	0	4
PHYS	2	0	3
or			
PHYS253	3	3	4
Free Elective	3	0	3
HUM Elective**	3	0	3
Social Sciences elective**	3	0	3
Totals	16	3	17
Second			
CHEM125	3	3	4
HUM 100-level course303**			
MATH152			
or			
MATH162	4	2	5
PHYS104			
or			
PHYS154	3	3	4
Totals	13	8	16
Fourth Semester			
MATH252	4	0	4
PHYS240	2	3	3
PHYS348	3	0	3
MATH Elective***	3	0	3
Social Sciences Elective**	3	0	3
Totals	15	3	16
Fifth			
PHYS300	2	3	3
PHYS308	3	0	3
PHYS405	3	0	3
Math Elective	3	0	3
Humanities or Social Sciences Elective**	3	0	3
Totals	14	3	15
Seventh Semester			
PHYS413	3	0	3
PHYS42	8	2	3
PHYS440	2	3	3
Physics Elective	3	0	3
Free Elective	3	0	3
Totals	13	6	15

Sixth			
PHYS304	3	0	3
PHYS309	3	0	3
PHYS406	3	0	3
PHYS427	2	3	3
Humanities or Social Sciences Elective**	3	0	3
Totals	14	3	15
Eighth Semester			
PHYS414	3	0	3
PHYS Elective	3	0	3
Free Elective	3	0	3
Free Elective	3	0	3
Humanities or Social Sciences Elective**	3	0	3
Totals	15	0	15
Total credit hours			**127**

* Some students may find it advisable to delay PHYS 103 until the second semester. See the AP curriculum below for example.

** Humanities and social sciences components of the General Education Program (see page 19 for details).

Bachelor's/M.S. in Medical Physics Double Degree Program
A five-year program leading to the Bachelor of Science in physics at IIT and the master of science in medical physics at the University of Health Sciences/The Chicago Medical School is offered. For more information, see the IIT Bulletin: Graduate Programs or consult the physics department chairman.

Bachelor of Science with Specialization in Applied Physics
Recognizing the growing demand for engineers and applied scientists in rapidly developing high-technology fields, the Department of Physics offers a unique interdisciplinary program leading to the Bachelor of Science degree in physics with specialization in applied physics. In addition to the common general education and basic science requirements for all scientists and engineers, this program consists of two major components: (i) a solid core of intermediate and advanced physics courses--both experimental and theoretical--which are relevant to contemporary applications; and (ii) a selection of courses designed and chosen by the

student and his or her advisers in an area of specialization in engineering, computer science, or other applied sciences. Examples of such areas are: electronics, telecommunications, computer science, materials science, or lasers and modern optics.

In support of these major components, additional electives in applied mathematics, computer modeling, or management, and an internship with an industrial, government, or university research laboratory are strongly encouraged.

This combination of solid training in the basics with a flexible applied component designed to meet both the demands of contemporary technology and the interests of the individual is the key to making graduates valuable as innovators and leaders in industry.

Physics--B.S. (Applied Physics)

Required Core	**Hours**
Major Courses	
PHYS 113, 103 or 153, 104 or 154, 203 or 253, 240, 300, 308, 348, 405	27
Other Selected Physics Courses to meet	
Physics Requirement	21

Applied Physics Electives	30

Mathematics Requirements

MATH 151, 152, 251, 252	18
Elective	3

Chemistry Requirement

CHEM 1244

Computer Science Requirement

CS 1052

Humanities and Social Sciences Requirements

ENGL 101, 100-level HUM	6

Humanities Electives

(300-level and above)	6
Social Science Electives (6 hrs. 300-level)	12

Electives

Electives to fulfill Engineering or Applied

Science Requirement

CHEM 126 or MS 101	3
Total Credit Hours	**132**

Curriculum

First

CHEM124	3	3	4
CS105	2	1	2
PHYS113	0	2	1
MATH151 or MATH161425			
ENGL101*	3	0	3
Social Sciences Elective*	3	0	3
Totals	15	8	18

Second

MATH or	5	2	
MATH162	4	2	5
PHYS103or PHYS153**	3	0	3
CHEM126or MS101	3	0	3
HUM 100-level course*	3	0	3
Social Sciences Elective*	3	0	3
Totals	16	2	17

Third

MATH251	4	0	4
PHYS or	1	0	4
PHYS154	3	3	4
Applied Physics Elective***	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	16	3	17

Fifth Semester			
PHYS300	2	3	3
PHYS308	3	0	3
Physics Requirement****	3	0	3
Math Elective	3	0	3
AP Elective***	3	0	3
AP Elective***	3	0	3
Totals	17	3	18
Seventh Semester			
PHYS405	3	0	3
Physics Requirement****	3	0	3
Physics Requirement****	3	0	3
AP Elective***	3	0	3
AP Elective***	3	0	3
Totals	15	0	15
Fourth			
MATH252	4	0	4
PHYS	2	0	3
or			
PHYS253	3	3	4
PHYS240	2	3	3
PHYS348	3	0	3
AP Elective***	3	0	3
Totals	15	6	17
Sixth Semester			
Physics Requirement****	3	0	3
Physics Requirement****	3	0	3
AP Elective***	3	0	3
AP Elective***	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	15	0	15
Eighth Semester			
Physics Requirement****	3	0	3
Physics Requirement****	3	0	3
AP Elective***	3	0	3
AP Elective***	3	0	3
Humanities or Social Sciences Elective*	3	0	3
Totals	15	0	15
Total Credit Hours			**132**

* Humanities and social sciences components of the General Education Program (see page 19 for details).

** Well-qualified students should take PHYS 103 or 153 and MATH 161 in the first semester. See the regular physics curriculum above for example.

*** Engineering or Applied Science requirement (see below).

**** Courses listed form part of the Physics Requirement detailed below. Those listed indicate specific scheduling suggestions, but the actual choice of courses is to be arranged with the student's adviser.

Physics Requirement

Of a minimum total of 34 credit hours, at least 28 credit hours must be chosen from basic courses and laboratories: PHYS 240, 300, 304, 308, 309, 348, 405, 406, 413, 414, 427, 428, and 440. The remainder is to be selected from PHYS 358, 401, 403, 404, 410, 412, 415, 418, and 437.

Engineering or Applied Science Requirement
(30 credit hours minimum): This component will be designed by the student and his or her advisers to achieve proficiency in one applied area of specialization. Representative programs in different areas of specialization are available upon request from the physics department. In general, courses in this component are primarily chosen from the regular curricula of the Armour College of Engineering and Science. For students pursuing professional careers, supplementary courses in management (information, human resources, etc.) from the Stuart School of Business and courses in computer applications (modeling, etc.) are encouraged for most specializations. Two free electives outside the areas mentioned above are permitted with the approval of the Advisory Committee.

Laboratory Requirements:
Students are normally expected to take both the Instrumentation Lab (PHYS 300) and the Advanced Physics Lab (PHYS 427-428), which provide them with basic modern laboratory techniques as well as opportunities to design their own experiments. They also are encouraged to take other engineering laboratory courses as appropriate to their individual programs. Substitution for one of the required laboratory sequences may be granted in cases where it can be justified by the particular program.

An internship with industrial, government, or university research laboratories is available for students who choose this option. Three to eight credit hours will be awarded, depending on the specific project involved.

Bachelor of Arts Concentration in Physics
Students interested in a program with even greater possibilities for interdisciplinary study may work toward the Bachelor of Arts (B.A.) degree with a major concentration in physics. The requirements are:

A. The B.A. requirements as described on page 22.

B. Physics component: (i) PHYS 103, 104, 203, 300, 304, 308, 348, 413; (ii) one additional laboratory course (PHYS 427 or 428); and (iii) four additional physics courses numbered above 300 arranged in consultation with the student's adviser. A detailed description of the B.A. program can be found on page 22.

Course Descriptions

PHYS 100 Physical Science
Introduction to the basic concept of physical science. Mechanics, fluids, heat, electromagnetic spectrum, radioactive decay. Periodic table, chemical formulas and equations, stoichiometry. Development of skills needed for chemistry, materials science, and physics. Does not count for graduation in an engineering or science degree program. (3-0-3)

PHYS 103,General Physics I: Mechanics
Elementary concepts in vectors and calculus; their use in the kinematical description of particle motion. Newton's three laws and their application to simple systems. Energy, momentum and angular momentum; rotational kinematics and dynamics and equilibrium of rigid bodies. Corequisite: MATH 151 or 161 or permission of the department. (3-0-3). PHYS 153 is Honors PHYS 103.

PHYS 104,General Physics II:: Waves and Thermal Physics
Oscillatory motion. Gravitation. Fluid mechanics. Waves: vibrating stretched strings and sound waves; reflection, refraction, and lenses. Temperature, first and second laws of thermodynamics, and kinetic theory of gases. Prerequisite: PHYS 103. Corequisite: MATH 152 or 162 or permission of the department. (3-3-4). PHYS 154 is Honors PHYS 104.

PHYS 113,Computers in Science I
Introduction to mathematics and science and PC software. Typically will include word processing, spreadsheets, graphics, data communications and database software. (0-2-1)

PHYS 120,Astronomy
A descriptive survey of observational astronomy, the solar system, stellar evolution, pulsars, black holes, galaxies, quasars, the origin and fate of the universe. (3-0-3)

PHYS 153,Honors General Physics I
See PHYS 103. (3-0-3)

PHYS 154,Honors General Physics II
See PHYS 104. (3-3-4)

PHYS 203,General Physics III:: Electromagnetism and Optics
Charge, electric field, Gauss's law and potential. Capacitance and resistance. Magnetic field, Ampere's law, Faraday's law, inductance. Electromagnetic oscillation. Physical optics: interference, diffraction, and polarization. Prerequisite: PHYS 104. Corequisite: MATH 251 or MATH 252. (3-3-4). PHYS 253 is Honors PHYS 203.

PHYS 207:, 208,Electromagnetism:, Optics:, and Modern Physics I:, II
Charge, electric field, Gauss's law, potential. Capacitance and resistance. Magnetic field, Ampere's Law, Faraday's Law, induction. Electromagnetic waves. Physical optics: interference, diffraction, polarization. Quantum physics, matter waves, atomic structure and spectra, solids, nuclei. Prerequisite: PHYS 104. Corequisite: MATH 251. (3-0-3); (1-3-2).

PHYS 211:, 212,Basic Physics I:, II
Intended to give students in the liberal arts, architecture, and design an understanding of the basic principles of physics and an appreciation of how the results of physics influence contemporary society. Prerequisite: MATH 122. This course does not count for graduation in any engineering or physical science program. (3-0-3); (3-0-3)

PHYS 213,Basic Physics Lab:: Mechanics:, Heat:, and Sound
Corequisite: PHYS 211. (0-3-1)

PHYS 214,Basic Physics Lab:: Electromagnetism and Optics
Corequisite: PHYS 211. (0-3-1)

PHYS 240,Introduction to Computational Physics
Application of computational techniques to investigating and visualizing fundamental physics, involving FORTRAN, C, Mathematica, and UNIX. Computational projects in periodic and chaotic motion of simple pendulum, motion of falling body and projectiles, energy storage in springs and electric circuits. LRC circuits. Satellite motion. Electric radioactive decay and evaluating integrals. Prerequisites: PHYS 203 or permission of the department. (2-3-3)

PHYS 253,Honors General Physics III
See PHYS 203. (3-3-4)

PHYS 300,Instrumentation Laboratory I
Basic electronic skills for scientific research. Electrical measurements, basic circuit analysis, diode and transistor circuits. Transistor and integrated amplifiers, filters, and power circuits. Basics of digital circuits, including Boolean algebra and design of logic circuits. Corequisite: PHYS 203. (2-3-3)

PHYS 304,Kinetic Theory and Thermodynamics
The notion of phenomenological characterization: pressure, volume, temperature, etc. The first and second laws of thermodynamics. Transport phenomena; thermodynamic functions and their applications. Introduction to Maxwell-Boltzmann statistics. Prerequisite: PHYS 203. (3-0-3)

PHYS 308:, 309,Classical Mechanics I:, II
Newton's Laws, one-dimensional motion, vector methods, kinematics, dynamics, conservation laws, and the Kepler problem. Collisions, systems of particles, and rigid-body motion. Approximation techniques, Lagrangian and Hamiltonian formulations of classical mechanics, small oscillations. Prerequisites: PHYS 203, MATH 252. (3-0-3); (3-0-3)

PHYS 348,Modern Physics for Scientists and Engineers
An introduction to modern physics with the emphasis on the basic concepts that can be treated with elementary mathematics. Subjects covered include Einstein's special theory of relativity, black body radiation, the Bohr atom, elementary wave mechanics, and atomic and molecular spectra. Corequisite: PHYS 203. (3-0-3)

PHYS 358,Geophysics
Survey course on solid-earth geophysics. Solar system. Age and rotation of earth. Gravity and tides. Earthquakes, seismic waves, and internal structure of earth. Earth's internal heat. Geomagnetic field. Paleomagnetism. Tectonics and anelasticity. Prerequisite: PHYS 203. (3-0-3)

PHYS 401,Statistical Physics
Statistical basis of thermodynamics. Kinetic theory. Fundamentals of statistical mechanics. Quantum statistics. Fluctuations and noise. Transport phenomena, Boltzmann equation. Prerequisites: PHYS 203, 304, 309. (3-0-3)

PHYS 403,Relativity
Introduction to the special and general theories of relativity. Lorentz covariance. Minkowski space. Maxwell's equations. Relativistic mechanics. General coordinate covariance, differential geometry, Riemann tensor, the gravitational field equations. Schwarzschild solution, astronomical and experimental tests, relativistic cosmological models. Prerequisites: PHYS 309, MATH 251, or consent of instructor. (3-0-3)

PHYS 404,Subatomic Physics
Historical introduction; general survey of nuclear and elementary particle physics; symmetries and conservation laws; leptons, quarks, and vector bosons; unified electromagnetic and weak interactions; the parton model and quantum chromodynamics. Prerequisite PHYS 203. (3-0-3)

PHYS 405:, 406,Fundamentals of Quantum Theory I:, II
The experimental origins and mathematical foundations of quantum theory. Wave formalism and matrix formalism. Harmonic oscillator and other simple one-dimensional systems. Angular momentum and spin. The hydrogen atom. Approximation methods. Temporal evolution of quantum mechanical systems. Prerequisites: PHYS 309, MATH 252. (3-0-3); (3-0-3)

PHYS 410,Molecular Biophysics
Thermodynamic properties of biological molecules. Irreversible and open systems, information theory. Biophysical measurements. Structure and properties of proteins. Enzyme action. Structure and properties of nucleic acids. Genetics at the molecular level. Molecular aspects of important biological systems. Prerequisite: Consent of instructor. (3-0-3)

PHYS 411,Astrophysics
Celestial mechanics and planetary motion; stellar structure and evolution; energy generation in stars; theory of white dwarfs, pulsars (neutron stars), and black holes; quasars; cosmology,

background microwave radiation, and the big bang model. Prerequisite PHYS 203 or consent of instructor. (3-0-3)

PHYS 412,Modern Optics and Lasers
Geometrical and physical optics. Interference, diffraction, and polarization. Coherence and holography. Light emission and absorption. Principles of laser action, characterization of lasers, and laser applications. Same as EE 413. Prerequisites: PHYS 348 or consent of instructor, CS 105. (3-0-3)

PHYS 413:, 414,Electromagnetism I:, II
Vector fields. Electrostatics and magnetostatics. Electromagnetic induction, radiation, and propagation phenomena. Polarization and magnetization. Introduction to classical electrodynamics. Prerequisites: PHYS 309, MATH 252. (3-0-3); (3-0-3)

PHYS 415,Solid State Electronics
Energy bands and carrier transport in semiconductors and metals. Physical principles of p-n junction devices, bipolar junction transistors, FETS, Gunn diodes, IMPATT devices, light-emitting diodes, semiconductor lasers. Same as EE 415. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

PHYS 418,Introduction to Lasers
Nature of light. Coherence and holography. Light emission and absorption. Principles of laser action. Characteristics of gas lasers, organic dye lasers, solid state lasers. Laser applications. Same as EE 418. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

PHYS 427, 428,Advanced Physics Laboratory I, II
Experiments related to our present understanding of the physical world. Emphasis is on quantum phenomena in atomic, molecular, and condensed matter physics, along with the techniques of measurement and data analysis. The second semester stresses project-oriented experiments on modern topics including spectroscopy, condensed matter physics, and nuclear physics. Prerequisite: PHYS 300 or consent of the instructor. (2-3-3); (2-3-3)

PHYS 437,Solid State Physics
Crystal structure and binding, lattice vibrations, phonons, free electron model, band theory of electrons. Electrical, thermal, optical, and magnetic properties of solids. Superconductivity. Prerequisite: PHYS 348 or consent of instructor. (3-0-3)

PHYS 440 Advanced Computational Physics
Basic computational techniques. Finding roots, solving ordinary differential equations using Runge-Kutta technique, solving eigenvalue problems using Numerov technique, Gaussian Quadrature, matrix operations, overview of solution of partial differential equations, Monte Carlo methods. Physics applications will be scattering by central potential, chaotic motion, white dwarf stars, Schroedinger equation, partial wave analysis, shell model of nucleus, steady state hydrodynamics, diffusion equation, Ising model and H2 molecule. Prerequisites: PHYS 240, 309, 348, and 405 or permission of the department. (2-3-3)

PHYS 491,Undergraduate Research
Student participation in undergraduate research, usually during the junior or senior year. Prerequisite: Recommendation of adviser and approval of the department chairman. (Credit: Variable)

PHYS 497,Special Topics in Physics
(Credit: Variable)

Minicourses in Physics
Minicourses are intended to teach the fundamentals of subjects which are not part of the regular curricula. They are scheduled two hours per week for seven weeks and carry one credit hour. Minicourses cannot be used as substitutions for required physics courses. They can be taken, however, as part of the natural science or engineering requirement of the General Education Program.

Graduate Courses
The following graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

PHYS 501,Methods of Theoretical Physics
PHYS 505 Electromagnetic Theory
PHYS 508Analytical Dynamics
PHYS 509Quantum Mechanics

Additional 500-level courses may be taken with special permission.

PSYCHOLOGY

Chairman: Dr. Glen O. Geist252 Life SciencesExtension 73500
Professors: Geist, Huyck, Wolach
Associate Professors: Aderman, Ayman, Hopkins, Lam, Schleser
Assistant Professors: Cassisi, Chen, Kaplan, Mitchell, Roldan, Stetson
Visiting Assistant Professor:Merbitz
Faculty Emeriti: Schurrager, Vermillion

Psychology has as its objective understanding the manner in which human beings and animals behave and the ways in which their behavior can be modified. Although jobs in many fields are open to persons holding only a bachelor's degree in psychology, most psychologists hold advanced degrees. Psychologists work in a variety of settings such as schools, courts, hospitals, clinics, industries, counseling centers, and research laboratories.

The department offers two undergraduate programs: one leading to the Bachelor of Arts degree and the other, to the Bachelor of Science. Both provide a common core of knowledge in the humanities, natural and social sciences, mathematics, and computer science. Students' progress in both programs is monitored by a faculty adviser who counsels and evaluates students, provides letters of reference, and encourages promising students to enter appropriate IIT graduate programs in psychology. While both programs prepare students for graduate training in psychology, the B.A. program may have more appeal for students preparing for graduate work in such fields as management, law, or social work, as well as for those who intend to enter business or industry immediately after graduation. Students who seek to become professional psychologists are advised to enter the B.S. program, in which they have opportunities to work on research projects with individual faculty members. Premedical and predental students also should follow the B.S. program. At least 33 credit hours of psychology are required for majors.

In addition to the above programs, the Departments of Psychology and Social Sciences offer an interdisciplinary major with a professional specialization in rehabilitation services, the only bachelor's program of its kind in Chicago. Specialists in rehabilitation services help to restore physically, mentally, and emotionally handicapped persons to their fullest potential.

Psychology--B.S.

Required Core Major	**Courses**	**Credit Hours**
PSYC 201, 204, 303, 310, 340, 406, 423, 452, 487		27
Electives		6
Mathematics Requirements		
MATH 151, 152, 221		13
Physics Requirements		
PHYS 103, 104		7
Chemistry Requirement		
CHEM 124, 126		7
Computer Science Requirement		
CS 105, 113, 200		6
Biology Requirements		
BIOL 107, 115		6
Humanities and Social Sciences Requirements		
ENGL 101, 100-level HUM		6
Humanities Electives (300- and above)		6
Social Science Electives(6 hrs.300-level)		12
Electives		
Individualized Minor Courses		18
Free Electives		12
Total Credit Hours		**126**

Curriculum

First			
PSYC 201	3	0	3
ENGL101**	3	0	3
MATH 151*	4	2	5
CS 113	0	2	1
Social Sciences Elective**	3	0	3
Totals	13	4	15
Third Semester			
PSYC 310	3	0	3
BIOL 107	3	0	3
CS 200	2	2	3
Social Sciences Elective**	3	0	3
Humanities Elective**	3	0	3
Totals	14	2	15
Fifth Semester			
PHYS 104	3	3	4
MATH 221	3	0	3
CHEM 124	3	3	4
Free Elective	3	0	3
Individualized Minor ***	3	0	3
Totals	15	6	17
Second			
PSYC 204	2	2	3
PSYC 303	3	0	3
MATH 152*	4	2	5
HUM 100-level course**	**3**	**0**	**3**
CS 105	2	1	2
Totals	14	5	16
Fourth Semester			
PSYC 340	3	0	3
PHYS 103	3	0	3
BIOL 115	3	0	3
Social Sciences Elective**	3	0	3
Individualized Minor***	3	0	3
Totals	15	0	15
Sixth Semester			
PSYC 423	3	0	3
CHEM 126	3	0	3
Humanities Elective**	3	0	3
Individualized Minor***	3	0	3
Free Elective	3	0	3
Free Elective	3	0	3
Totals	18	0	18
Seventh			
PSYC 452	3	0	3
PSYC 406	3	0	3
Social Science Elective**	3	0	3
Individualized Minor***	3	0	3
Psychology Elective	3	0	3
Totals	15	0	15
Eighth			
PSYC 487	3	0	3

Psychology Elective	3	0	3
Individualized Minor***	6	0	6
Free Elective	3	0	3
Totals	15	3	15

* Depending on their level of preparation, students may be placed in another mathematics sequence.
** Humanities and social sciences components of the General Education Program, (see page 19 for details).
*** Students must plan a specialized minor in consultation with their departmental adviser. The minor will be designed to complement their professional studies.

Bachelor Of Arts Concentration In Psychology
The B.A. program provides greater flexibility than the B.S. program in the selection of courses to be completed. The B.A. program is a minimum 126 hours that must include: (A) PSYC 201, 204, 301, 303, 340, 406, 423, 452, 487, and three departmentally approved psychology electives; (B) BIOL 115, which may be included in the natural science general education requirement for the B.A., (C) MATH 221, which is not considered part of the general education requirements in mathematics for the B.A., (D) an Individualized Minor of 15 hours to be set by the student in consultation with his or her department adviser. The student must satisfy all further Bachelor of Arts requirements in physical education, mathematics, the natural sciences, humanities, and the social sciences (see page 22).

Optional Programs Combined Degree Programs
A major in psychology may be used as the basis for the combined undergraduate-graduate professional degree programs in law (B.A./ J.D.), business (B.A./ M.B.A.), public administration (B.A./M.P.A.), or rehabilitation counseling (B.A./M.S.) offered by IIT. With the consent of the department chairman, undergraduate psychology students may enroll in some graduate-level psychology courses. Applications for admission to graduate programs at IIT (leading to the degrees of master of science in psychology, master of science in rehabilitation counseling, and doctor of philosophy in psychology) from students earning undergraduate degrees from IIT are encouraged.

Course Descriptions
(S) identifies courses that may be taken to fulfill Social Sciences General Education requirements. All 300 level courses marked with an (S) require as prerequisites that students have successfully completed at least one other course with an (S) and ENGL 101.
(N) may be applied toward the General Education requirement in natural sciences.

PSYC 201,Introductory Psychology
Fundamental methods, facts, and principles of psychology. Experimental approach to the study of behavior and experience as they occur in the normal individual. (3-0-3) (S)

PSYC 204,Experimental Psychology and Research Methods
Introduction to experimental methodology in learning, motivation, and psychophysics. Design, performance, and analysis of basic experiments. Prerequisites: PSYC 201, MATH 221. (2-2-3) (N)

PSYC 301,Industrial Psychology
Survey of practical applications of psychology to problems of business and industry; work, job placement, morale, safety, turnover, absenteeism, and training. (3-0-3) (S)

PSYC 303,Abnormal Psychology
Survey of the dynamics underlying behavior deviations. Considers therapeutic procedures, psychopathology. (3-0-3) (S)

PSYC 310,Social Psychology
Description and analysis of behavior and experience as determined by social conditions. Includes social issues, human relations, prejudice, and leadership. (3-0-3) (S)

PSYC 325,Psychology of Adolescents
Physiological, emotional, cognitive, and social characteristics of adolescent development. Influence of family, vocation, interests, etc. (3-0-3) (S)

PSYC 340,Developmental Psychology

Processes and theories of mental, social, emotional, and physiological development from conception to old age. Research evaluation, field experience. (3-0-3) (S)

PSYC 400,Perception
Problems, experiments, and theoretical formulations of the phenomena of perception, stressing behavioral aspects rather than physiological mechanisms. Prerequisite: 12 hours of psychology. (3-0-3) (N)

PSYC 406,History and Systems of Psychology
Historical development of influential psychological systems: structuralism, functionalism, behaviorism, psychoanalysis, and Gestalt psychology. Prerequisite: 12 hours of psychology. (3-0-3) (S)

PSYC 409,Psychological Testing
Survey of current group tests, emphasizing basic concepts; e.g., validity, reliability, as well as practical applications and measurement techniques. Prerequisites: PSYC 201 and MATH 221. (3-0-3)

PSYC 410,Vocational Rehabilitation
Historical, philosophical, and legal bases of rehabilitation. Study of vocational, independent/living, public and private rehabilitation, service delivery systems, and roles and functions of the practitioner. Prerequisite: PSYC 201. (3-0-3) (S)

PSYC 411,Medical Aspects of Disabling Conditions
Survey of human organ systems, medical terminology, unique characteristics of disabling conditions, including severe disabilities. Vocational consequences, environmental impact and implications for the rehabilitation process. One of a two-course sequence. Prerequisite: PSYC 201. (3-0-3) (S)

PSYC 412,Psychosocial Aspects of Disabling Conditions
Personal adaptation and coping processes following disability, psychological and social consequences of disabling conditions, sexuality and disability, attitudes toward persons with disabilities, stigma management. One of a two-course sequence. Prerequisite: PSYC 201. (3-0-3) (N)

PSYC 414,Physiological Psychology
An introduction to the biological bases of behavior with an emphasis on the neuroanatomy and neurophysiology of sensory and central nervous systems. Prerequisite: PSYC 201. (3-0-3) (N)

PSYC 420,Single Subject Design and Applied Behavior Analysis
Single-subject experimental designs for the evaluation of environmental variables on behavior of individuals. Applied Behavior Analysis, Precision Teaching, and frequency measures for logical inference. Ethical, logical, scientific, and practical aspects of "real-world" experimentation for optimizing performance or learning in education, treatment, and training. (3-0-3)

PSYC 423,Learning Theory
Survey of contributions of major learning theorists and pertinent studies. Prerequisite: 12 hours of psychology. (3-0-3) (S)

PSYC 426,Cognitive Processes
Survey of research in cognitive psychology; affirmative, conjunctive, and disjunctive rules, transfer paradigms, distinctiveness of cues, shift paradigms. Prerequisite: PSYC 204. (3-0-3) (S)

PSYC 431,Measurement of Attitudes
Survey of methods used in attitude scale construction. Development and use of such scales. Multidimensional scaling. Prerequisite: MATH 221. (3-0-3)

PSYC 449,Practicum in Rehabilitation Services
Seminar and supervised fieldwork experience in a rehabilitation setting with disabled individuals. Emphasizes service delivery, interviewing techniques, and caseload management. Prerequisites: SOC 480, PSYC 410, 411, and 412 or concurrent registration. (3-0-3)

PSYC 452,Personality Theory

Survey of personality theories and their application to everyday life. Prerequisite: PSYC 201. (3-0-3) (S)

PSYC 456,Engineering Psychology
Theory of human physical and psychological abilities as they relate to design of transportation, housing, workplace, defense, and recreational systems. Topics include theories relating to psychophysiology, anthropometry, communications, man-machine interactions, training, maintainability, safety, and engineering evaluation. Prerequisite: PSYC 201. (3-0-3) (S)

PSYC 487,Integrative Psychology
Seminar
A synthesis of issues and areas in psychology. Prerequisites: Junior standing, 21 credit hours in psychology, and MATH 221. (3-0-3)

PSYC 489,Undergraduate Psychology Seminar
Reports and discussion of current problems and issues in psychology. Prerequisites: PSYC 201 and 204, or consent of instructor. (3-0-3) (S)

PSYC 497,Special Problems
Independent study involving compilation and analysis of data bearing on a significant problem. Prerequisites: Junior standing and consent of instructor. (Credit: Variable)

Graduate Courses
Graduate courses are available to degree-seeking undergraduate students with the approval of the course instructor and faculty adviser. See the current IIT Bulletin: Graduate Programs for course descriptions.

REHABILITATION SERVICES

Director: Dr. Chow Lam (Psychology)248B Life SciencesExtension 73514
Coordinator: Dr. William J. Grimshaw (Social Sciences)232 Life Sciences Extension 75128

Students who wish to earn a joint Bachelor's Degree in Psychology and Sociology can participate in a unique program that offers a specialization in Rehabilitation Services. The program offers the advantages of a strong liberal arts foundation and specific preparation for entry-level positions in the field of rehabilitation. The field of rehabilitation is growing and provides the opportunity to serve people with disabilities. Students in this program develop a basic understanding of human development and the social-psychological forces that are at play in the lives of individuals and families who are adapting to disabilities. Students also study theories of career development, work functioning, and job placement. This allows them to assist individuals with disabilities prepare to enter the world of competitive employment.
Undergraduate students have the opportunity to study under faculty who have different rehabilitation backgrounds and expertise. Program faculty are engaged in an exciting array of experimental and field research. The ambitious student has ample opportunity to take part in research.

Bachelor Of Arts in Psychology/Sociology

1. B.A. degree is interdisciplinary in both psychology and sociology.

2. No additional minor is required.

3. Students must take an additional 15 hours of coursework in order to fulfill the social sciences requirement. These courses must be marked with an (S) in the Bulletin.

4. Students also must satisfy all other requirements for the B.A. degree listed in the Bulletin on page 22.

5.> Students are required to complete a one-semester practicum in the field before graduation.

With the B.A. degree, graduates of the program are well prepared to compete for entry-level positions in the field of rehabilitation and for continuing graduate studies in rehabilitation or other areas in the helping professions, such as counseling or social work.

Psychology/Sociology --B.A

Required Core Courses	**Credit Hours**
PSYC 201, 303, 340, 410, 411, 412, 449, 562, 563	27
SOC 200, 201, 348, 371, 374, 401, 480	21
Mathematics Requirement	
MATH 141, 221	6
Chemistry Requirement	
CHEM 130	3
Computer Science Requirement	
CS 105, STX 113	3
Biology Requirements	
BIOL 107, 109, 115	9
Humanities Requirements	
ENGL 101, HUM 100-level	6
Electives (at least 6 hours at 300-level or above)	9
Social Science Requirements	
At least 6 hours at 300-level or above At least nine hours outside the disciplines of sociology and psychology Required courses in the major do not count toward this requirement.	15

Senior Project

STX 411	3
Electives	
Free Electives	24
Total Credit Hours	**126**

Following is a model for this curriculum:

Curriculum

First

MATH 141	3	0	3
STX 113	0	2	1
ENGL 101*	3	0	3
PSYC 201	3	0	3
BIOL 107	3	0	3
BIOL 109	1	4	3
Totals	13	6	16

Third Semester

MATH 221	3	0	3
BIOL 115	3	0	3
PSYC 303	3	0	3
Humanities Elective*	3	0	3
Social Sciences Elective*	3	0	3
Totals	15	0	15

Fifth Semester

SOC 371	3	0	3
SOC 374	3	0	3
PSYC 410	3	0	3
PSYC 411	3	0	3
Social Sciences Elective*	3	0	0
Totals	15	0	15

Second

HUM 100-level course*	3	0	3
CS 105	2	1	2
CHEM 130	3	0	3
(or equivalent)			
SOC 200	3	0	3
SOC 201	3	0	3
Free Elective	3	0	3
Totals	17	1	17

Fourth Semester

PSYC 340	3	0	3
SOC 348	3	0	3
Humanities Elective (300 Level)*	3	0	3
Social Sciences Elective*	3	0	3
Free Elective	3	0	3
Free Elective	3	0	3
Totals	18	0	18

Sixth Semester

SOC 480	3	0	3
PSYC 412	3	0	3
Humanities Elective (300 Level)*	3	0	3
Social Sciences Elective	3	0	3
Free Elective	3	0	3
Totals	15	0	15

Seventh

PSYC 562	3	0	3
SOC 401	3	0	3
Social Sciences Elective (300 Level)*	3	0	
Free Elective	3	0	3
Free Elective	3	0	3
Totals	15	0	15

Eighth

STX 411	3	0	3
PSYC 449	3	0	3
PSYC 563	3	0	3
Free Elective	3	0	3
Free Elective	3	0	3
Totals	15	0	15
Total Hours:			126

*Humanities and social sciences components of the General Education Requirements (see page 19).

**Students must complete one year of physical education consisting of one sixteen-week swimming course (PE011-PE015) and two eight-week elective courses (PE021-PE033).

ROTC:: AIR FORCE AEROSPACE STUDIES

Chairman: Lt. Col. Richard L. Barnes101 Military Science Building Extension 73525
Professor: Barnes
Assistant Professors: Meyer, Spencer

Air Force ROTC is conducted at approximately 600 colleges and universities throughout the United States in order to select and train men and women to become commissioned officers in the U.S. Air Force. Most graduates who enter the Air Force through Air Force ROTC are assigned to positions consistent with their academic major. Others, who wish to do so, may qualify to become pilots and navigators. Men and women who complete graduation requirements and the Professional Officer Course receive commissions and enter active duty as second lieutenants. Officers who qualify may take graduate training prior to beginning their military duties.

Financial Aid

Scholarships are available to qualified graduate and undergraduate students in both the four-year and two-year programs. These pay full tuition and fees, textbook allowance, and a monthly subsistence allowance. All members receive a subsistence allowance of $100 per month in their final two academic years. Scholarships are available for four-, three-, and two-year periods depending on the student's academic major. Qualified students desiring operational, technical/scientific, nontechnical (business), nursing, or health-related (medicine, optometry) options should contact the Department of Air Force Aerospace Studies.

Courses

The General Military Course (AS 101, 103, 203, 205), examines the role of U.S. military forces in the contemporary world, with particular attention to the United States Air Force and its organization and mission.

The Professional Officer Course (AS 310, 311, 408, 409) provides an examination of the broad range of U.S. civil-military relations, the environmental context in which U.S. defense policy is formulated and implemented, and the principles and practices of leadership and total quality management as they relate to the U.S. Air Force.

A student may take any of these courses without entering the AFROTC program.

Four-Year Program

The Air Force ROTC offers both the four-year and two-year commissioning programs for men and women IIT students. The four-year program consists of the four-semester General Military Course (GMC) and the four-semester Professional Officer Course (POC). Students normally start this program as freshmen but may begin as sophomores by enrolling in both the freshman and sophomore-year classes. Students not on scholarship may withdraw from the GMC at any time. Participants in the POC are selected from qualified volunteer applicants. An Air Force ROTC-paid, four-week field training encampment, held at an Air Force base, is required for POC students. This requirement is normally completed during the summer between the sophomore and junior years. The major areas of study during field training include junior officer training, aircraft and aircrew orientation, career orientation, survival training, base functions, and the Air Force environment.

Two-Year Program

The two-year program consists of a paid six-week summer field training encampment and the four-semester Professional Officer Course. Participants in this program are selected from qualified volunteer applicants. This program is designed for undergraduate and graduate students with less than three but at least two years remaining at IIT. The six-week field training is held at an Air Force base and is a prerequisite for the POC. The major areas of study at field training are the same as in the four-year program with the addition of the GMC academic curriculum. Upon successful completion of the six-week program, which includes the GMC academic curriculum, transfer credit of three semester hours will be applied toward the completion of the AFROTC minor.

Minor

Students may select a minor in Air Force Aerospace Studies. See page 29 for course requirements.

Curriculum			
First AS 101	1	1	1
Third Semester			
AS 203	1	1	1
Fifth Semester			
AS 310	3	1	3
Seventh Semester			
AS 408	3	1	3
Second			
AS 103	1	1	1
Fourth Semester			
AS 205	1	1	1
Sixth Semester			
AS 311	3	1	3
Eighth Semester			
AS 409	3	1	3

1. Air Force aerospace students may not take any Air Force aerospace courses on a pass/fail basis.

2. GMC courses AS 101, 103, 203, and 205 academic curricula are included in the Two-Year Program's Six Week Field Training.

Course Descriptions

AS 101,Organization of the U.S. Air Force
Study of doctrine, mission, and organization of the U.S. Air Force and the strategic offensive and defensive forces. Leadership Laboratory develops leadership potential and ability to work with small units. (1-1-1)

AS 103,U.S. Defense
Study of aerospace defense; missile defense; general purpose and support forces; Air Combat Command and Air Mobility Command in limited war; Army, Navy, and Marine general purpose forces. Leadership Laboratory continued. (1-1-1)

AS 203,Development of Airpower I
Analysis of the development of airpower from the beginning through World War II with a critical look at doctrine, technology, and organization. Leadership Laboratory continued. (1-1-1)

AS 205,Development of Airpower II
A continuation of the development of airpower to the present and an objective look at the peaceful uses of aerospace power. Leadership Laboratory continued. (1-1-1)

AS 310,Introduction to Air Force Management I
Study of management functions, practices, and policies. Includes Total Quality Management, human relations, communications skills, counseling, leadership theory, functions, and practice. Advanced Leadership Laboratory in the operation of the Cadet Corps. (3-1-3)

AS 311,Introduction to Air Force Management II
Study of staff functions and command-staff relationships, performance standards, and data processing. Includes counseling, ethics, discipline, problem-solving, and professionalism. Continuation of the Advanced Leadership Laboratory. (3-1-3)

AS 408,National Security Forces in Contemporary American Society I

The impact of technological and international developments on strategic preparedness and the overall policy-making process. Advanced Leadership Laboratory continued. (3 1-3)

AS 409,National Security Forces in Contemporary American Society II
Study of Military Justice System, the role of the professional military leader-manager in a democratic society; the requisites for maintaining adequate national security forces; societal attitudes and constraints on the national defense structure; and the development of communicative skills. Advanced Leadership Laboratory for development and practice in dealing with large and more complex groups. (3 1-3)

Leadership Laboratory
A cadet-centered activity held in conjunction with all courses listed above. It provides leadership training experiences which will improve a cadet's ability to perform as an Air Force officer. Introduction to Air Force customs and courtesies; preparation for individual, flight, and squadron movements in drill and ceremonies; and direction of the cadet corps. Cadets have the opportunity to fly in various aircraft, such as, KC-135, C-130, UH-1, F-16, T-37, T-38, etc.

ROTC: MILITARY SCIENCE

Chairman: Major Michael B. Bonner 730 Science and Engineering Building, University of Illinois at Chicago, (312) 996-3451

IIT Program Director:
Cpt. Cardell Hervey, Jr.
207 E1 Extension 77553
Professor: Bonner
Assistant Professors: Hervey, Marko

The principal objective of the college-level Reserve Officer's Training Corps (ROTC) program is to develop commissioned officers for the Active Army, the Army National Guard, and U.S. Army Reserve. Each course is designed to develop essential qualities and traits of leadership required for success in either a civilian or a military career.
Instruction is offered through either a four-year or two-year program. The four-year program consists of the Basic Course (freshman and sophomore years) and the Advanced Course (junior and senior years). The two-year Advanced Course is open to students eligible for advanced placement through a variety of options. Both programs include attendance at Camp Adventure (a six-week advanced summer camp) just prior to commissioning.

Basic Course
The basic course is an introduction to Military Science and carries no military obligation. Completion is a prerequisite to enrollment in the Advanced Course. Prior service, completion of basic combat training through the National Guard or Reserve, or completion of Camp Challenge may be substituted for the Basic Course.

Advanced Course
All cadets who successfully complete the Basic Course, meet the physical and academic requirements, pass an officer-qualification test and a physical examination are eligible for selection by the Professor of Military Science for the Advanced Course. A tax-free subsistence allowance of $100 per month is paid to each cadet in the Advanced Course except during attendance at summer camp, when pay is approximately $100/week. Upon graduation and successful completion of the Advanced Course and the Professional Military Education Requirements (PME's), cadets are commissioned as second lieutenants in the Active Army, the Army Reserve, or the National Guard.

Summer Camp
Cadets are paid approximately $700 during both Camp Challenge (the Basic Camp), and Camp Adventure (the Advanced Camp). Travel to and from camp is at government expense. Meals, housing, medical care, uniforms, and equipment are furnished.

Professional Military Education Requirements (PME's)
In order to receive a well-rounded education, cadets are required to complete courses in the following areas: advanced written communications, human behavior, military history, computer literacy, and math reasoning. Scholarship students also must take a foreign language.

Simultaneous Membership Program (SMP)
Membership in the Army National Guard or United States Army Reserve offers cadets additional experience as officer trainees, and these individuals will receive both the ROTC subsistence allowance and drill pay. They may also receive additional money while attending school.

Financial Assistance
In addition to a monthly subsistence of $100, the program offers four-year federal scholarships. Three- and two-year federal Army ROTC Scholarships are also available to qualified students. For further information, call (312) 567-7553 or visit the Military Science Office.

Curriculum

First	Lect.	Lab.	Cred Hrs.
MILS 101	1	2	1
Totals	1	2	1

Second Semester			
MILS 102	1	2	1
Totals	1	2	1
Third Semester			
MILS 201	2	2	2
Totals	2	2	2
Fourth Semester			
MILS 107/202	3/3	2/2	3/3
Totals	3/3	2/2	3/3
Fifth Semester			
MILS 301	3	2	3
Totals	3	2	3
Sixth Semester			
MILS 302	3	2	3
Totals	3	2	3
Seventh Semester			
MILS 401	3	2	3
Totals	3	2	3
Eighth Semester			
MILS 402	3	2	3
Totals	3	2	3

NOTE:

MILS 147-48/247-48 *Aerobic Conditioning (2 credit hours) is required for all scholarship cadets in the Basic Program.
MILS 347-48/447-48 *Aerobic Conditioning (2 credit hours) is required for all Advanced Course cadets.

Course Descriptions

MILS 101,Customs and Traditions of
Military Service
An introduction to the history and practical application of U.S. Army customs, traditions, and personal discipline. (1-2-1)

MILS 102.U.S. Defense Establishment
Authority relationships and structural aspects of the defense establishment, role of the U.S. Army as an instrument of national power. (1-2-1)

MILS 107, American Military History
In-depth study of American Military History through examination of evolvement of the Army and warfare. (3-2-3)

MILS 147,Aerobic Conditioning
Participation in aerobic exercise program; evaluation of the level of cardiovascular fitness. (0-3-2)
MILS 148/247/248/347/348/447/448 - same as above. (0-3-2)

MILS 201,Leader/Subordinate Relations
The fundamentals, principles, and traits of leadership; role of the intermediate supervisor in military operations; introduction and practical application of the U.S. Army Leadership Assessment Program. (2-2-2)

MILS 202,Introduction to American Military History
Analytical study of American military history from its origin through the Vietnam conflict. Emphasis on leadership, strategy, the principles of war, and growth of the military in the U.S. (3-2--3)

MILS 301,Theory and Dynamics of Organizational Leadership
Study of group processes, motivation, communications, socialization, organizational effectiveness, and the impact of leader behavior on the leadership process; viewed from the military perspective. Departmental approval required. (3-2-3)

MILS 302,Military Operations and Tactics
Introduction to the principles of war and their application on the modern battlefield; practical application of small unit leadership, combined arms operations, and tactical patrolling techniques. Departmental approval required. (3-2-3)

MILS 388,Group Practicum in Staff Skills
Demanding application of leadership and staff skills in a realistic, military, group environment. Students task organize, plan and implement advanced group projects. Requires approval of Professor of Military Science. (credit: 1-4 hours)

MILS 401,Training and Resource Management
Theory and application of U.S. Army Training Management doctrine; introduction and study of U.S. Army Resource Management techniques. Departmental approval required. (2-3)

MILS 402,Military Law
Nature, structure, powers, and procedures of the Uniform Code of Military Justice; fundamentals of apprehension, conduct of searches, rules of evidence, and handling of witnesses. Departmental approval required. (3-2-3)

MILS 499,Advanced Individual Research
Intensive research of selected topics. Paper usually required. Advanced course status and Department approval required. (Credit: 1-4 hours)

ROTC: NAVAL SCIENCE

Chairman: Capt. R. Timothy Myers 201 Military Science Extension 73529
Professor: Myers
Associate Professor: Holland
Assistant Professors: Dosev, McGowen, Smith, Trygstad

The Naval Reserve Officers Training Corps (NROTC) offers an opportunity for young men and women to qualify for a commission in the U.S. Navy or U.S. Marine Corps while attending college. While pursuing their academic studies, midshipmen of the NROTC unit receive a professional education and the necessary specialized training to qualify them to become commissioned Navy or Marine Corps officers.

As commissioned officers in the United States Navy, graduates may serve in one of the various components of the U.S. Fleet, such as surface or subsurface ships, the aviation community, or nuclear power. Of particular interest is the opportunity to serve as an operating engineer abroad a nuclear or conventionally powered ship. The theoretical knowledge obtained at IIT is combined with practical knowledge and early responsibility in the operation and management of the latest in missile, aircraft, and high-performance ship propulsion systems.

Students may request the option to become officers in the U.S. Marine Corps. A commission in the Marine Corps may lead to a specialization in aviation, infantry, engineering, armor, communications, or supply.

Undergraduate Study

The objective of the program in Naval Science is to supplement the student's academic study with specialized education in naval subjects and practical training and experience so that upon commissioning the future officer can become a productive member of the naval community. Active duty naval officers are assigned as instructors in the NROTC unit. It is their responsibility to assist the students in translating the theoretical knowledge they receive into the practical skills and knowledge they will require after commissioning and to provide both professional and personal counseling.

Classroom experience is principally directed toward providing education in those technical areas that are peculiar to the naval environment -- for example, navigation. Knowledge of customs and traditions of the service is provided through seminars and contact with Navy personnel. During the summer, students are assigned to naval ships and stations where their education as future naval officers is enhanced by on-the-job training. Scholarship NROTC students receive about six weeks of summer training each year; College Program students attend training during the summer preceding their last academic year.

All four-year scholarship midshipmen take identical naval science courses during their first two years. Between their third and fourth years, Marine Corps NROTC students will attend a summer training program at the Marine Corps Development and Education Command in Quantico, Virginia.

Scholarship Program

NROTC scholarship students are selected by nationwide competition. The NROTC Scholarship pays for a majority of the tuition, books, and fees and provides a tax-free stipend each month for four years. Graduates are commissioned as naval officers and incur an obligation of four years of active duty.

College Program

Admission to the College Program is controlled by the Professor of Naval Science. Students incur no obligation to the naval services for participation in this program until their junior year. Qualified students enrolled in this program may be recommended for scholarships by the Professor of Naval Science. In addition to uniforms and some naval science books issued to students enrolled in this program, the Navy provides a tax-free stipend each month during the junior and senior years. Graduates are commissioned as Reserve naval officers and incur an obligation of three years of active duty.

Two-Year Programs

The Navy/Marine Corps offer two two-year programs; one of these is a Scholarship Program, the other is a two-year College Program. Students are selected before April 1 of their sophomore year and attend a six-week Naval Science Institute in the summer before entering their junior year. Scholarship benefits for the junior and senior year are identical to those received by students in the four-year program during their junior and senior years.

Academic Requirements

Scholarship program students are encouraged to pursue majors in engineering and applied sciences to meet the technological demands of the modern Navy. Most other fields of study leading to a baccalaureate degree are permitted with the approval of the Professor of Naval Science. All Navy option scholarship program students are required to complete one year each of calculus and physics.

College Program students and students enrolled in the Marine Corps option are encouraged to take courses in calculus and physics or pursue a science or engineering major. In addition to the prescribed naval professional academic courses, the naval faculty conducts laboratories all four academic years to give students experience in practical leadership.

All students are required to complete a course in American Military Affairs or National Security Policy. With approval of the Professor of Naval Science, selected university courses may be substituted for prescribed naval professional academic courses. Naval science courses are not offered on a pass-fail basis.

Optional Program

Students may select a minor in naval science. See page 32 for course requirements.

Curriculum

First Semester	Lect.	Lab.	Cred. Hrs.
NS 101	2	2	2
Second Semester			
NS 102	3	2	3
NS 103	0	2	0
Third Semester			
NS 201	3	2	3
Fourth Semester			
NS 202	2	2	2
Fifth Semester			
NS 301	3	2	3
Sixth Semester			
NS 302	3	2	3
Seventh Semester			
NS 401*	2	2	2
Eighth Semester			
NS 402	2	2	2
Marine Option			
Fifth Semester			
NS 310	3	2	3
Sixth Semester			
NS 311**	3	2	3
Seventh Semester			
NS 410	3	2	3

Eighth Semester

NS 411***	3	2	3

*MGT 351 may be substituted with approval.
**PS 330, PS 333, or PS 339 may be substituted with approval.
***PS 333 may be substituted with approval.

| NS 411 is required for graduation for Navy Option midshipmen only.

Course Descriptions NS 101,Introduction to Naval Science
A general introduction to seapower and the naval service. The instruction places particular emphasis on the mission, organization, regulations, and broad warfare components of the Navy. Included is an overview of officer and enlisted rank and rating structures, procurement and recruitment, training and education, promotion and advancement, and retirement policies. The course also covers the basic tenets of naval courtesy and customs, discipline, naval leadership, and ship's nomenclature. The student is made cognizant of the major challenges facing today's naval officer, especially in the areas of human resource management. Prerequisite: Consent of instructor. (2-2-2)

NS 102,Naval Ships Systems
Designed to familiarize midshipmen with the types, structure, and purpose of naval ships. The design of naval ships is examined with respect to safety of operations and ship stability characteristics. Included are nuclear and conventional propulsion systems, auxiliary power systems, interior communications, and basic damage control. Offered spring semester. Prerequisite: Consent of instructor. (3-2-3)

NS 103,Sail Training
Designed as an introduction to small boat handling. Through lectures and sailing with the IIT Sailing Club, students gain knowledge of and an appreciation for the forces of wind and sea. Topics include relative motion, navigation and piloting, marlinspike seamanship, leadership and teamwork, and preventive and corrective maintenance. Required for all Navy option midshipmen. Prerequisite: Consent of instructor. (0-2-0)

NS 201,Naval Weapons Systems
This course provides an introduction to the theory and principles of operation of naval weapons systems. It includes coverage of types of weapons and fire control systems, capabilities and limitations, theory of target acquisition, identification and tracking, trajectory principles, and basics of naval ordnance. Offered fall semester. Prerequisite: Consent of instructor. (2-2-3)

NS 202,Seapower and Maritime Affairs
A course based on the premise that the student must develop knowledge and interest in seapower and maritime affairs. The course is oriented toward the general concept of seapower (including the merchant marine), the role of various warfare components of a navy in supporting the Navy's mission, the implementation of seapower as an instrument of national policy, and a comparative study of U.S. and Soviet naval strategies. Prerequisite: Consent of instructor. (2-2-2)

NS 301, 302,Navigation and Naval Operations I, II
A comprehensive study of the theory, principles, and procedures of ship navigation, movement, and employment. Competency is achieved in the areas of piloting and celestial and electronic means of shipboard navigation. Operations topics include communications, sonar, radar search, and screening theory. Tactical formations and dispositions, relative motion, maneuvering board, and tactical plots are analyzed for force effectiveness and unity. Rules of the road, lights, signals, and navigational aids are also covered. Prerequisite: Consent of instructor. (2-2-3); (3-2-3)

NS 310, 311,Evolution of Warfare I, II
A survey of all military history designed to provide the student with a basic knowledge of the art and concepts of warfare and its evolution from the beginning of recorded history to the present. Included within this study is a consideration of the influence that leadership, political, economic, sociological, and technological factors have had on warfare and the influence they will continue to exert in the age of limited warfare. Prerequisite: Consent of instructor. (2-2-3); (3-2-3)

NS 401,Naval Leadership and Management I

A course stressing the experiential approach to learning the principles of leadership and management. The student develops skills in the areas of communication, counseling, control, direction, management, and leadership through active guided participation in Navy-based case studies, experiential exercises, and situational problems. Management theory and professional responsibility are emphasized. Prerequisite: Consent of instructor. (2-2)

NS 402,Naval Leadership and Management II
This course is designed to provide the student with a comprehensive exposure to leadership principles and applications. An emphasis on leadership development complements NS 401's concentration on management methods. Prepares the midshipman for the personal and professional responsibilities he or she will encounter upon commissioning as a Navy Ensign assigned to Division Officer duties. Prerequisite: Consent of instructor. (2-2)

NS 410, 411,Amphibious Warfare I, II
The course is designed to provide the student with an historical survey of the evolution of amphibious warfare in the twentieth century. An in-depth survey of the Gallipoli landing is followed by a study of the development of modern amphibious doctrine. Emphasis is placed on case studies of WW II: Pacific landing operations and Allied landings in north Africa, northern Europe, and Italy. Prerequisite: Consent of instructor. (3-2-3); (3-2-3)

SCIENCE AND TECHNOLOGY

In Context (STX)
Director: Dr. Warren Schmaus136A Life SciencesExtension 73473
Humanities Coordinator: Dr. Thomas Misa148 Life SciencesExtension 73475
Social Sciences Coordinator: Dr. Ullica Segerstrale290 Life Sciences Extension 75134
Natural Sciences Coordinator: Dr. Porter Johnson105 Siegel Hall Extension 73375
Faculty: Applebaum (History), Beam (Public Administration), Davis (Center for the Study of Ethics in the Professions), DeForest (Political Science), P.W. Johnson (Physics), Meade (Mechanical and Aerospace Engineering), Misa (History), Schmaus (Philosophy), Segerstrale (Sociology), Snapper (Philosophy), Weil (Center for the Study of Ethics in the Professions), Zehr (Sociology)

What is an acceptable level of risk to society from nuclear reactors? Do engineers have a special responsibility to ``blow the whistle'' on their companies when they appear to be producing unsafe products? What should be done about scientists who publish false or misleading results? How has the development of science changed the way we think about space, time, matter, and the world around us?

These are only some of the questions that are addressed by Science and Technology in Context (STX) majors. An interdisciplinary faculty seeks to understand the growth and application of science and technology in its social, ethical, political, historical, and philosophical context. It is impossible to think seriously about how science and technology affect people's lives, however, without a thorough study of mathematics, science, and technology. Science and Technology in Context integrates technical and professional studies with the humanities and social sciences to provide students with a truly liberal education that will prepare them for life in a technological society.

Career possibilities for STX majors include making and implementing policy regarding science, health, energy, or the environment; mapping out corporate strategy; administering and assessing science and technology in government; planning urban development; or writing and publishing in scientific and technical fields. IIT's undergraduate major in Science and Technology in Context is excellent preparation for graduate and professional study in a wide variety of fields, including law, medicine, business and public administration, architecture, and teaching and research in a technical, scientific, humanistic, or social scientific discipline. The major offers a flexible program of study that can be shaped to meet the student's personal goals.

The foundation of the STX program consists of courses in the basic sciences, humanities, and social sciences that are common to a wide variety of majors. Freshman seminars introduce students to current issues concerning the role of science and technology in our society. Sophomore ``core'' courses examine the history, philosophy, sociology, and politics of science and technology. Junior research seminars focus on contemporary issues such as technological risk, openness, and secrecy in science and technology, technology and the third world, and fraud and misconduct in scientific research. Upper-division students also develop a professional concentration consisting of four to six upper-level courses in a single scientific, engineering, pre-professional, or management field to be chosen by the student. Seniors, with the guidance of faculty advisers, plan and carry out individual research projects that culminate in senior theses.

Professional Concentrations
Students may choose from a wide range of scientific, engineering, and professional concentrations, each of which has been reviewed by IIT faculty who do advanced research in the special field. The concentration, although not a degree program, becomes the focus of study for the student and can form the nucleus for continued study towards a degree in the area of concentration.

Concentrations have been specified in: biology, biotechnology, human biology, chemistry, professional chemistry, applied chemistry, computer science, mathematical modeling, numerical methods, probability and statistics, physics, psychology, rehabilitation psychology, pre-medical studies, law and legal policy studies, mechanical engineering/energy, mechanical engineering/ structures and motion, material science and engineering, finance, electrical engineering, architecture, and more. The student may also design a professional concentration with the approval of a faculty adviser.

STX Curriculum (Bachelor of Science)
Students must earn at least 126 credit hours, and satisfy the following minimum distribution requirements:

1. STX 113 and 202.

2. A professional concentration in a science, engineering, or professional field. This is a minimum of 15 advanced (above the freshman level) credits in the special field. Each concentration couples studies within the field to an STX technical elective focused on the special field. (Many professional concentrations include courses with advanced prerequisites. Students who wish to study those fields must prepare carefully, in consultation with their advisers.)

3. Twelve credits of STX core courses. Six credits of STX technical electives. Eight hours of STX junior seminar.

4. A six-credit senior thesis, applying the study of STX to the professional concentration.

5. All university and college requirements for a Bachelor of Science degree (see page 19).

First Semester	**Lect**	**Lab**	**Cred. Hrs.**
MATH 151	4	2	5
CHEM 124	3	3	4
ENGL 101	3	0	3
STX 113	0	2	1
Science or Engineering Elective*-	2	-	5
Totals	10	7	15-18
Third Semester			
STX Core Courses**	6	0	6
PHYS 104	3	3	4
Mathematics Elective	--	--	3-4
Science or Engineering Elective***	--	--	3-4
Totals	9	3	16-18
Fifth Semester			
STXJunior Seminar	2	2	4
Professional Concentration	--	--	6-8
Humanities or Social Science Elective****	3	0	3
Humanities or Social Science Elective****	3	0	3
Totals	9	0	16-18
Seventh Semester			
STX 481Senior Thesis I	0	5	3
Professional Concentration	--	--	3-4
Humanities or Social Science Elective****	3	0	3
STX Technical Elective	3	0	3
Free Elective	--	--	3
Totals	6	5	5-16
Second			
MATH 152	4	2	5
PHYS 103	3	0	3

HUM 100-level course

	3	0	3
STX 202	2	0	2
Science or Engineering Elective*	--	--	2-4
Totals	12+	2+	15-16
Fourth Semester			
STX Core Courses*	6	0	6
Science or Engineering Elective	3	3	4
Free Elective	--	--	6
Totals	9	0	15-16

Sixth Semester

STX Junior Seminar	4	0	4
Professional Concentration	--	--	6-8
Humanities or Social Science Elective****	3	0	3
Humanities or Social Science Elective***	3	0	3
Totals	10	16-18	

Eighth Semester

STX 482	0	5	3
Professional Concentration	--	--	34
Humanities or Social Science Elective****	3	0	3
STX Technical Elective	3	0	3
Free Elective	--	--	3
Totals	6	5	15-16

Students should take courses that are compatible with the prerequisite structures for their professional concentrations. Most students choose from BIOL 107/109, CS 105/200, EG 105 in the first semester and from CHEM 125, BIOL 115, MS 101, CS 105/200, EG 105 in the second semester.

Courses numbered between STX 300 and STX 315. Students should take courses that provide introductions to at least two disciplines (sociology, political science, philosophy, or history). Students who have not as yet taken a computer science course take CS 105 or CS 200. Humanities and social sciences electives are used to satisfy the General Education Requirements (see p. 19).

STX Curriculum (Bachelor of Arts)

Students must earn at least 126 credit hours and satisfy the following minimum requirements for the B.A. degree specified on page 22 of this Bulletin:

1. TX 113 and 202.

2. welve credits of STX core courses (numbered STX 301 through 312).

3. ine additional credits of STX electives.

4 A four-credit STX junior seminar (four-credit courses numbered STX 381 and above).

5. A six-credit senior thesis (STX 481/482).

First Semester	**Lect**	**Lab**	**Cred. Hrs.**
MATH 121, 141, 151, or 161	3-5	0-2	3-5
CS 103 or 105	2	1 2	
ENGL 101	3	0 3	
Natural Science	---	---	3-4
STX 113	0	2 1	
General Education Elective*	---	---	0-3
Totals	8+	3+	12-17

Second Semester			
MATH 122, 142, 152, 162, or 221**	3-5	0-2	0-5
HUM 100-level course	**3**	**0**	**3**
Natural Science	3	---	3-4
STX 202	**2**	**0**	**2**
General Education Elective*	3	---	0-3
Technical Elective***	3	---	0-3
Totals	17+	2+	14-17
Third Semester			
STX Core Courses	6	0	6
Natural Science	3	---	3-4
General Education Electives****	6	---	6
Technical Elective***	3	---	0-3
Totals	18	0	18
Fourth Semester			
STX Core Courses	6	0	6
Natural Science	3	0	3-4
General Education			
Electives ****	6	0	6-9
Technical Elective***	3	0	0-3
Totals	18	0	15-18
Fifth Semester			
STX Junior Seminar	4	0	4
STX Elective	3	0	3-6
Minor	3	0	3-6
General Education			
Elective ****	3	0	0-3
Free Elective	3	0	3-6
Totals	16+	0	16-19
Sixth Semester			
STX 411	**2**	**2**	**3**
STX Elective	3	0	3-6
Minor	3	0	3-6
General Education			
Elective****	3	0	0-3
Free Electives	3	0	3
Totals	14	2	16-19
Seventh Semester			
STX 481	**0**	**5**	**3**
Minor	3	0	3-6
STX Elective	3	0	0-3
General Education			
Elective****	6	0	0-6
Free Electives	6	0	6-9
Totals	8	5	15-18
Eighth Semester			
STX 482	**0**	**5**	**3**
Minor	3	0	0-3

STX Elective	3	0	0-3

General Education

Electives****	6	0	0-6
Free Electives	6	0	6-15
Totals	8	5	15-18

*Freshman year general education electives may be used towards fulfilling the social sciences requirement.
**Students who successfully complete five credits of math during the first semester will have satisfied the math requirement for the B.A. and need not take additional math. Students interested in the social sciences are advised to take MATH 221.

***Technical electives are courses students take during their first two years in order to satisfy the prerequisites for their chosen minors.

****Sophomore, junior, and senior year general education electives may be used towards fulfilling both the humanities and social sciences requirements.

Course Descriptions

STX 113,Computers in Science
Introduction to personal computer software with applications to research in STX. Software includes word processing, databases, spread sheets, electronic mail, and access to bibliographic services. Same as CS 113. (0-2-1)

STX 202,Introduction to STX
An introduction to social and cultural issues regarding science and technology. (2-0-2)

STX 301,The Social Dimension of Science
Examines how social and psychological factors influence the reasoning and behavior of scientists. Through contrasting traditional views of science with actual scientific practice the course aims at understanding such phenomena as ``hype,'' resistance to scientific discovery, controversy, vicious competition, error, self-deception, and fraud. Same as SOC 301. (3-0-3)

STX 302,Science and Belief
Explores the relationship between science and belief through comparing Western science with other belief systems, science with religion, and science with pseudoscience. The course also examines cultural and ideological influences on scientific knowledge, and public faith in science. Same as SOC 302. (3-0-3)

STX 303,Politics of Science and Technology
Explores the interrelationships among science, technology, and politics, with emphasis on the political issues created by contemporary nuclear physics and molecular biology. Investigates: the politics of scientific discovery; procedures for scientific advice to government; the impact of industrial technology on the economy and
science; and the social implications of science and technology and how they can be predicted, measured, and controlled. Same as PS 332. (3-0-3)

STX 305,Origins of Modern Science
An examination of the profound change in our conception of the natural world from Copernicus (1500 A.D.) to Newton (1700 A.D.) and of the adoption of experimentation, quantification, and new instruments to create a new conception of scientific method. Same as HIST 380. (3-0-3)

STX 306,Industrial Society 1750 -1900
The transformation of the physical and biological sciences from the Enlightenment to the 20th Century and its effects on culture, politics, and belief; the creation of science-based technologies and the creation of the profession of scientist. Same as HIST 381. (3-0-3)

STX 307,Technology in History 1500 -1850
Explores the process of technological change during the birth of industrial societies. Considers the context of early industrial development in Europe, then examines the industrial revolution in Britain and America. Concludes by assessing technology's role in European domination of Asia and Africa. Same as HIST 382. (3-0-3)

STX 308,Technology in History 1850 -Present
Examines technological change as a characteristic activity of modern societies. Investigates the science-based ``second'' industrial revolution in Europe and America. Explores the varied responses of artists, writers, architects, and philosophers to the machine age. Concludes by discussing technology's place in the modern nation-state. Same as HIST 383. (3-0-3)

STX 309,History of Engineering
An introduction to the history of engineering in the United States. The course will focus on the contributions of individual engineers and a social history of the engineering profession. Same as HIST 372. (3-0-3)

STX 310,Philosophy of Science
Through an analysis of the concepts of explanation, theory, hypothesis, experiment, and observation, this course seeks an understanding of how the growth of knowledge is possible. Same as PHIL 341. (3-0-3)

STX 311,Science and Method
A history of the interaction between science and philosophy in recent centuries, showing how changing conceptions of metaphysics and scientific method have influenced the development of renaissance astronomy, nineteenth-century atomic theory, ether theories, theories of geological and biological change, etc. Same as PHIL 350. (3-0-3)

STX 312,Science in Society
The course focuses on the institution of science in its wider political, economic, cultural, and social contexts. It examines the interaction between science and these contexts through case studies concerning the role of science in political policy, the popular press, museums, the courtroom, industry, education, and social issues generally. Same as SOC 303. (3-0-3)

STX 317,Technology and Social Change
Examines major changes in social institutions and the role that technical innovations have played; introduces the student to various approaches to assessment and forecasting. Same as SOC 362. (3-0-3)

STX 318,Medical Sociology
Examines the social dimensions of patient and physician behavior, medical and nursing education, the organization of medical settings-particularly the hospital; social epidemiology; the politics of health care, unorthodox medicine, the delivery of services, and the systems of other nations. Same as SOC 374. (3-0-3)

STX 320,Politics of Energy
Examines the ``energy crisis'' and the conflicting proposals made for dealing with it. Applies the tools of policy analysis to: the growing dependence of the United States on fossil fuels, contemporary domestic and global energy conflicts, and the struggles to reduce U.S. dependence and vulnerability. Assesses the opportunities to increase supplies of conventional fuels, the development of synthetic and renewable fuels, and improvements in conservation and efficiency. Same as PS 338. (3-0-3)

STX 321,Nuclear Energy and Society
Examines nuclear energy in the context of science, technology, and national, local, and global social concerns. Includes a detailed study of nuclear fission in the context of World War II and the subsequent nuclear arms race. Considers the risks of continued proliferation, the prospects for arms control and the ``peaceful atom,'' and the chances for survival in a nuclear world. Same as PS 339. (3-0-3)

STX 335,Science Fiction of H.G. Wells
Examines the social and political thought of H.G. Wells as revealed in his early scientific romances. The course also examines why Wells called these romances ``sociological fables.'' Same as ANTH 344. (3-0-3)

STX 342,Philosophy of Mind
An examination of various concepts and theories of the mind and mental activity, such as mind-body dualism, the mind-brain identity theory, and behaviorism. Same as PHIL 342. (3-0-3)

STX 344,Philosophy of Mathematics

An investigation into problems of the foundations of mathematics, the concept of proof, the relationship of mathematics to logic, the reality of mathematics, etc. Same as PHIL 344. (3-0-3)

STX 345,Space and Time
An investigation into philosophical problems of space and time raised by modern physics and geometry: relativity, time travel, the topology of space and time, the direction of time, etc. Same as PHIL 345. (3-0-3)

STX 346,Philosophy of the Life Sciences
An examination of the philosophical problems raised by evolutionary theory and the reduction of biology to physics and chemistry. Same as PHIL 346. (3-0-3)

STX 356,History of Biology in Modern Times
History of problems and development of the major theories in the fields of evolution and genetics, cytology, disease and therapeutics, biochemistry, molecular biology, and the transformation of the medical and biological professions. Same as HIST 386. (3-0-3)

STX 360,Science:, Reason:, and Imagination in English Literature
The impact of the Scientific Revolution of the seventeenth century and the Age of Reason upon English literature as expressed in the works of John Donne and the metaphysical poets, Milton, and later, Dryden, Pope, Fielding, and Johnson. Same as ENGL 372. (3-0-3)

STX 361,Literature of Modern Science
The literature of science from the Renaissance to modern times. Same as ENGL 334. (3-0-3)

STX 365,Moral Issues in Engineering
The problems of moral and social responsibility for the engineering profession, including such topics as safety, confidentiality, government regulation, etc. Same as PHIL 370. (3-0-3)

STX 366,Business Ethics
Ethical issues relating to individual and corporate responsibility, self- and governmental regulation, investment, advertising, urban problems, the environment, preferential hiring. Same as PHIL 373. (3-0-3)

STX 367,Moral Issues in Computer Science
Moral problems raised by the concept of intellectual property and its relationship to computer software, professional codes of ethics for computer use, responsibility for harm resulting from the misuse of computers. Same as PHIL 374. (3-0-3)

STX 371,Concepts of Physics
Counter-examples to intuitive notions. Postponed discoveries and ``no-go'' theorems. Paradoxes of probability and foundations of quantum mechanics. Empiricism; phenomenology; fundamental and frame theories. Technology and experiment. Complex systems. Prerequisite: PHYS 203 or consent of instructor. Same as PHYS 353. (3-0-3)

STX 381,Technological Risk and Society
This seminar examines the natural and man-made dangers faced by our technological society, as well as the concepts and terms we have invented to analyze these dangers. Among the seminar's topics are risk communication, risk selection, policy formation, and grass-roots politics. (4-0-4)

STX 382,Science and Culture
Explores the links between our general culture and scientific theorizing, models, and results. Investigation of the mutual interaction among scientific, philosophical, religious, and other kinds of thought from a historical, philosophical, and sociological perspective. (4-0-4)

STX 383,Fraud and Misconduct in Research
What constitutes good science? This seminar studies not only the recent notorious cases of ``faking'' scientific data, but the more subtle problems of negligence, carelessness, and recklessness in science as well. Problems raised by proposed solutions are then explored. (4-0-4)

STX 384,Openness and Secrecy in Science and Technology
This seminar investigates the kinds of social values and organization that make the growth of knowledge possible and the kinds of restrictions that inhibit it. Specifically, the effects of such

things as industrial and military secrecy, copyrights, and patents on scientific research will be considered. (4-0-4)

STX 411,Seminar on Current Issues
Restricted to upper division students in the Lewis College Bachelor of Arts programs. Advanced students apply their varied backgrounds to an interdisciplinary study of current issues and societal problems, such as the enforcement of norms for scientific honesty, the appropriateness of risk assessment procedures for policy decisions, and the influence of patent policy on technological advance. This course is taken by students preparing their Senior Project on Contemporary Issues. (See page 239). (2-2-3).

STX 423,Seminar in History and Architecture of Cities
Selected topics examined in depth. Topics will be announced prior to registration each semester. Same as CRP 371 (3-0-3)

STX 425:, 426,History and Architecture of Cities I:, II
Selected topics in the history and development of human settlements. Examination of the forces affecting city development in history. These courses are taught as seminars and meet for one three-hour period per week. Same as CRP 425, 426. (3-0-3) (3-0-3)

STX 431,Development of Sociological Thought
Surveys ideas and issues that have influenced the history of sociology and continue to bear significantly on current theory. Analyzes major figures, schools of thought, conceptual themes, and controversies. Same as SOC 431. (3-0-3)

STX 450,History and Systems of Psychology
Historical development of influential psychological systems; structuralism, functionalism, behaviorism, psychoanalysis, and Gestalt psychology. Prerequisite: 12 hours of psychology. Same as PSYC 406. (3-0-3)

STX 468,Computers and Society
Discussion of the impact of computer technology on present and future society. Historical development of the computer. Social issues raised by cybernetics. Prerequisite: CS 105 and at least junior standing. Same as CS 485. (3-0-3)

STX 470,History of Mathematics
History of Mathematics from ancient times to the seventeenth century. Same as MATH 490. (3-0-3)

STX 481/482,Senior Thesis
For senior level students. (Credit: Variable).

STX 485/486,Independent Reading and Research
For advanced students. (Credit: Variable)

SOCIAL SCIENCES

Chairman: Dr. William J. Grimshaw 232 Life Sciences Extension 75128
Professor: Stover
Associate Professors: Beam, DeForest, Grimshaw
Assistant Professors: Segerstrale, Zehr
Adjunct Professor: Pounian
Faculty Emeriti: Goldman, Larkin
The Department of Social Sciences encompasses the disciplines of political science (including public administration), sociology, and anthropology, each of which retains its separate identity. A complete undergraduate program is offered leading to the degree of Bachelor of Arts, with concentrations in either political science or sociology. Anthropology, political science, and sociology also contribute to the social sciences requirement of the General Education Program.

Political Science
Political science deals with the analysis and appraisal of political ideas, institutions, problems, and issues, including those developing at the intersection of science and technology with society. The Bachelor of Arts degree with a political science concentration may lead directly to a career as a policy analyst or as an elected political official. More likely, it will lead to further professional training in law, public or private management or planning, and to careers in local, state, federal, or international governmental agencies, in nonprofit organizations, or in for-profit firms.

Bachelor of Arts Concentration in Political Science
All political science majors must take MATH 221 -- Basic Probability and Statistics and at least 30 credit hours in political science, including the following courses: PS 200 -- American Government and PS 273 -- Great Political Thinkers.
With departmental approval, up to six of the required credit hours may be taken in related departments.

B.A./J.D. Double Degree Program
Political science is an especially appropriate major for a student planning to enter law school upon completion of his or her undergraduate degree. Qualified students may satisfy the requirements for the Bachelor of Arts in political science and for the Juris Doctor in six years, with law courses taken during the senior year serving as the minor field. See page ??? for further details.

B.A./M.P.A. Double Degree Program
The requirements for the B.A. in political science and Master of Public Administration (M.P.A.) degree may be completed in five years. Qualified students interested in careers in the public sector are encouraged to begin their preparation at the undergraduate level and follow a course of study that will allow them to move directly into the M.P.A. program. Students would enroll as political science majors and would obtain the B.A. at the end of the fourth year. Any time after the fifth semester, students can request admission to the M.P.A. program. Students granted provisional admission are then allowed to take one graduate course each semester while completing the requirements for the B.A. by carrying an average load of 16 or 17 hours each semester. One-third of the requirements for the M.P.A. can be completed by the end of the eighth semester, when the B.A. is awarded. A final decision on M.P.A. admission would be made on the basis of the student's record at that time. By then a student would have completed the M.P.A. foundation courses. The remainder of the master's requirements would be fulfilled in the fifth year. A typical program for such students would consist of:

Undergraduate
Credit hours

General Education Requirements	42-46
Political Science Major Requirements	21
Political Science Electives	15 (
must include PS 462)	
Minor	15-18
Free Electives	24-31
Total	124
Public Administration Foundations	9 (

PA 501, 502, 562)	
Graduate Credit hours Public Administration Foundations (completed while an undergraduate)	9
MPA Required Core (PA 509, 522, 531, 542)	11
MPA Electives	12
Total	32

Sociology
Sociology is the study of societies, communities, and smaller groups; it deals with the way in which these groups are organized and maintained and how individual behavior is related to group experiences. The study of human behavior offers essential knowledge to all students wishing to understand the crucial problems facing society. The Bachelor of Arts with a concentration in sociology has two major objectives: to prepare future social scientists, who will continue their work in graduate schools; and to provide skills and information for those entering applied professions such as social planning, law, and medicine.

Bachelor of Arts Concentration in Sociology
All sociology majors must take MATH 221-- Basic Probability and Statistics and at least 33 credit hours in sociology, including SOC 200-- General Sociology, SOC 201-- Social Psychology, and SOC 431 -- Development of Sociological Thought.

Bachelor of Arts Interdisciplinary Concentration: Sociology and Psychology
In addition to the above programs, the Departments of Psychology and Social Sciences offer an interdisciplinary major with a professional specialization in rehabilitation services, the only bachelor's program of its kind in Chicago. Specialists in rehabilitation services help to restore physically, mentally, and emotionally handicapped persons to their fullest potential. See Rehabilitation Services section for details.

Course Descriptions
(S) identifies courses that may be taken to fulfill Social Sciences General Education requirements. All 300-level courses marked with an (S) require as prerequisites that students have successfully completed at least one other course marked with an (S) and the basic writing requirement (usually by completion of ENGL 101).

Anthropology

ANTH 202,General Anthropology
Introduces students to fossil man, prehistoric archaeology, the origins of civilization, and the nature of human culture. (3-0-3) (S)

ANTH 211,Human Origins
Analyzes the evidence for human evolution and the emergence of Homo sapiens. Examines man's primate heritage and the beginnings of human society. (3-0-3) (S)

ANTH 212,Stonehenge and the Origins of Europe
Surveys the Bronze Age origins of medieval feudalism, with Stonehenge taken as a monument to its beginning. This course addresses the question: Does Europe of the Middle Ages derive from the heritage of Barbarian Europe or from the classical heritage of the Roman Empire following its collapse? (3-0-3) (S)

ANTH 344,Science Fiction of H. G. Wells
Examines the social and political thought of H.G. Wells as revealed in his early scientific romances. The course also examines why Wells called these romances ``sociological fables.'' (3-0-3) (S)

ANTH 345,Modern Science Fiction
Surveys the literature of science fiction after it was established as a publisher's category in response to the research revolution. (3-0-3) (S)

ANTH 346,History to Come

Readings in the science fiction of Robert A. Heinlein, including all of his ``future history'' stories. Like H.G. Wells, his acknowledged master of the sf genre, Heinlein is a writer of sociological significance. Examined in this light is his key idea, that of ``time binding.'' The instructor is Heinlein's authorized biographer. (3-0-3) (S)

ANTH 347,H.G. Wells: Things to Come
A showing of H.G. Wells's ``Things To Come,'' with a reading of the early film treatment, the published scenario, and the post-production script. The lectures place the film, with other works of Wellsian science fiction, in the context of totalitarian idealism. (3-0-3) (S)

ANTH 412,China Past and Present
Analyzes Chinese civilization from prehistoric origins to modern outcome. The pattern of change and continuity from Confucian China to Communist China. (3-0-3) (S)

ANTH 491,Individual Research
Allows students with special skills and interests who would like, in their own projects, to explore some new areas of anthropological research. Prerequisite: Consent of instructor. (Credit: Variable; maximum 5 credit hours) (S)

Political Science

PS 200,American Government
Surveys American politics and government. The informal political institutions, such as parties and interest groups, are analyzed and related to the formal governmental institutions, such as the presidency and the Congress. Emphasis is placed on how the American political culture shapes these institutions and how public policies are produced. (3-0-3) (S)

PS 201,Politics and Public Policy
Analyzes how social problems become public problems and how the government develops public policies and with what effect. Emphasizes the characteristics of the American policy-making process. Case studies are used to clarify the process. (3-0-3) (S)

PS 205,Political Parties and Public Opinion
Examines political parties as agents of change and stability in the United States. Considers political socialization, political groups, public opinion, and political participation. Reviews historical development of the American party system through voter realignments and changing political issues. Analyzes party structure and organization, partisan competition, nominations, elections, and party government. (3-0-3) (S)

PS 256,Law in American Society
Examines the nature of law and the legal system in our society. Special attention will be paid to the institutions of the legal system, how they are supposed to function, and how they actually do function. Topics for study include the police, prosecutors, lawyers, judges, juries, grand juries, and public defenders. In addition, courts ranging from trial courts to the U.S. Supreme Court are studied. Finally, the impact of U.S. Supreme Court decisions on the system of justice in the U.S. are explored. (3-0-3) (S)

PS 273,Great Political Thinkers
Introduces students to the ideas of the world's great political philosophers. Plato, Aristotle, Hobbes, Locke, Rousseau, Marx, and others will be covered. (3-0-3) (S)
NOTE: All political science courses numbered above 300 require as prerequisites successful completion of a 200-level political science course or departmental approval, at least one other course marked with an (S), and ENGL 101.

PS 303,Politics and the Media
Analyzes the media's role in contemporary American politics and government. Emphasis is placed on how the media, both newspapers and television, manufacture the news and how the news influences political and government agenda, decision making, and public policies. (3-0-3) (S)

PS 315,Urban Politics
Examines city and metropolitan politics and government. Emphasizes how economic and demographic changes influence local politics, how local politics work, and how state and national policies influence local politics. Special attention is devoted to Chicago politics. (3-0-3) (S)

PS 316,Popular Culture and City Politics
The course uses films and literature to explore how the city has been depicted in popular culture. Themes and topics include: the ``search for order'' in the family, the workplace, and the neighborhood; religion, race, and ethnicity; conformity and alienation. These themes will be discussed in terms of the larger social, political, and economic systems. The course also examines the ``physical city'' as an expression of dominant and competing values of the larger culture. Special attention will be given to Chicago. (3-0-3) (S)

PS 317,Chicago Politics
The study of Chicago's politics and government from both historical and contemporary perspectives. Emphasis is placed on changes that have significantly shaped the direction of Chicago's politics. Special attention is devoted to social class, ethnicity, race, and ideology as factors that have influenced the Democratic political machine and its opposition. (3-0-3) (S)

PS 318,Contemporary Constitutional Issues
The course examines how decisions about some of our basic rights are made. Emphasizes U.S. Supreme Court decisions in the areas of criminal law, desegregation, education, welfare, housing, and consumer law. Related topics of special interest to students in the class can be added to the syllabus. Supreme Court decisions are read and supplemented by textual material. (3-0-3) (S)

PS 330,International Relations
Examines the relations among nations from the perspective of both the international system and the nation state. Emphasizes the transformation in the international system caused by the development of nuclear weapons and the revolution in trade and communications; compares the nature, function, and purpose of modern warfare and other forms of conflict with the prospects for international order through law, organization, communications, and arms control. Gives special attention to the international policies of the United States toward various regions and its role in international organizations. (3-0-3) (S)

PS 332,Politics of Science and Technology
Explores the complex interrelationships among science, technology, and politics, with emphasis on the political issues created by contemporary nuclear physics and molecular biology. Gives roughly equal attention to: the politics of scientific discovery; the development of government organization for science and scientific advice to government; the impact of industrialized science and advanced technology on the economy and science; and the growing debate over the social implications of science and technology and how they can be predicted, measured, and controlled. (3-0-3) (S)

PS 333,National Defense Policy
Examines the formulation and implementation of national security and military policy in the United States. Surveys the emergence and growth of military strategy and the defense establishment, with primary emphasis on contemporary issues, institutions and policies, and prospects for the future. Emphasizes the impact of nuclear weapons on military strategy and security and the contemporary conflict between nuclear escalation and arms control. (3-0-3) (S)

PS 338,Energy and Environmental Policy
Places energy and environmental policy in domestic and global contexts. Traces the economic and political implications of dependence on fossil fuels and the attempt to develop alternate energy sources and promote conservation. Assesses the environmental effects of resource consumption and the effort to control these effects by increased efficiency and regulation of pollution. Explores such problems as nuclear waste, acid rain, global warming, and defrostation. Examines national and international attempts at economics, political, and technological solutions. (3-0-3) (S)

PS 339,Nuclear Energy and Society
Explores the relationship between nuclear energy--science, technology, and products--and society--national, local, and global. Gives detailed attention to the discovery of nuclear fission and its exploitation during World War II and after, culminating in the contemporary nuclear arms race. Examines the emergence and growth of nuclear power and the rise of the controversy over its safety, security, and economy. Considers the risks of continued proliferation, the prospects for arms control and the ``peaceful atom,'' and the chances for survival in a nuclear world. Uses films, case studies, guest lectures, and simulations where appropriate. (3-0-3) (S)

PS 345,The American Presidency
Surveys the evolution of the office and powers of the presidency as a result of historical forces, institutional factors, and the actions of those who have served as President. Studies the relationships of presidents with political parties, Congress, the bureaucracy, media, and the public, emphasizing both domestic and foreign policy. Gives major attention to changes in the presidential selection process and their implications for those who run and win the office. Examines the alleged crisis of the contemporary presidency and the proposals for overcoming it. (3-0-3) (S)

PS 351,Public Administration
Examines the nature of administrative organization, decision making in organization, and organization structure and processes: division of work, authority, communications, and planning. Considers the role of the government executive. Analyzes relation of fiscal procedures and personnel management to organization. (3-0-3) (S)

PS 355,Political Sociology
Surveys major issues and problems in the field of political sociology. Topics include the forms of political power structures, elitist approaches to politics, community and national power structure, and political socialization. (3-0-3) (S)

PS 452,Bureaucracy
Analyzes bureaucracy in its social context. The evolution of the theory and practice of bureaucracy as a form of control, coordination, and social order are considered. Emphasizes government bureaucracies, with selected examples from other organizations. (3-0-3) (S)

PS 453,Regulatory Policy and Politics
Examines the changing role of government regulation of private and public activities from a political and administrative perspective. Explores reasons for the growth of government regulation from the Progressive era through the New Deal to the social regulation of the 1970s and for the subsequent controversy over economic and social deregulation. Investigates the regulatory process, including administrative law, standards for rule-making, and the involvement of organized groups and the courts. Studies specific cases from such areas as transportation, environment, energy, public health, and research and development. (3-0-3)

PS 462,American Governmental nstitutions
Constitutes an advanced course in American government primarily for the political science major or student taking the Public Administration Option. The course focuses on the policy-making process with special emphasis given to the relationship between politics and administration at all levels of government. Prerequisite: PS 200 or consent of instructor. (3-0-3) (S)

PS 477,Topics in the Study of Politics
Provides students a reading and seminar course on a selected topic of politics. Subject matter will change in successive offerings of the course. (3-0-3) (S)

PS 497,Directed Readings in Political Science
Consists of independent reading and analysis, centered on particular problems and supervised by a member of the political science faculty. Prerequisite: Consent of instructor. (Credit: Variable; maximum credit 4 hours) (S)

Sociology

SOC 200,General Sociology
Introduces students to the structure and operation of society by using the basic sociological concepts of social institutions, social processes, and social change. Analyzes individual behavior from the point of view of cultural and group influences. Emphasizes the structure and problems of American society. (3-0-3) (S)

SOC 201,Social Psychology
Examines how contemporary society molds individuals to its image. Topics include: human instinct, values and needs, attitudes, the process of socialization, suggestion and propaganda, rumor, prejudice, social conflict, conformity, social values, and interaction. (3-0-3) (S)

SOC 240, Social Problems
Analyzes selected problems affecting American society, including: poverty among and discrimination against minorities; crime and delinquency; urban problems; United States and world population problems; foreign policy and militarism. (3-0-3) (S)

SOC 242,Industrial Society
Analyzes social issues of particular relevance to scientists and engineers: demographic trends and their effects on schools, labor markets, workplaces, and other institutions; the changing role of the United States in the world political economy; the impact of changing technology on work and employment; the shift to a service economy; the Japanese challenge to American business and industry; responses of both the public and private sectors to these issues. (3-0-3) (S)

SOC 245,Criminology
Considers social and legal conceptions of crime in historical perspective. Research methods, ecology of crime, patterns in criminal behavior, and current theories of crime are analyzed. The societal reaction to criminal behavior, methods of control, punishment, and rehabilitation. (3-0-3) (S)

SOC 248,Juvenile Delinquency
Considers delinquency as a socio-psychological process. Sources of information, research methods, and empirical research data are analyzed and used to evaluate current theories. The societal reaction to delinquency; its definition, prevention, and treatment. (3-0-3) (S)

SOC 249,Sociology of the Family
This course examines the family in its cultural, social, and economic contexts: how the family forms, function, and ideology are related to other aspects of society; and how the family serves as the environment for interpersonal behavior. Among the topics to be considered are feminine and masculine roles, alternative lifestyles, parenthood, and the changes in family related to the human life-cycle. (3-0-3) (S)

SOC 259,Race and Ethnic Relations
The course examines the social, psychological, and cultural dimensions of race and ethnic relations in the context of modern society. Major theories regarding the origins and impact of interracial and interethnic conflict are analyzed, with special emphasis placed on the consequences of such conflict for the wider society. Governmental responses to prejudice and discrimination also are examined. (3-0-3) (S)
NOTE: All sociology courses numbered above 300 require as prerequisites successful completion of at least one sociology course at the 200 level, at least one other course marked with an (S), and ENGL 101.

SOC 301,The Social Dimension of Science
Examines how social and psychological factors influence the reasoning and behavior of scientists. Through contrasting traditional views of science with actual scientific practice, the course aims at understanding such phenomena as ``hype,'' resistance to scientific discovery, controversy, vicious competition, error, self-deception, and fraud. (3-0-3) (S)

SOC 302,Science and Belief
Explores the relationship between science and belief through comparing Western science with other belief systems, science with religion, and science with pseudo-science. The course also examines cultural and ideological influences on scientific knowledge and public faith in science. (3-0-3) (S)

SOC 311 Comparative Social Structure
Examines theories of social organization with particular focus on complex bureaucratic organizations, social stratification, and social change; also considers basic social institutions (e.g., family, government) in light of relevant theories. (3-0-3) (S)

SOC 321,Social Inequality
Evaluates the patterns and dimensions of social, economic, and political inequality in American society and how these compare with other societies; who gets ahead and why; the relationship of social class to other features of society; some consequences of social stratification; and outlooks for the future of inequality in the United States. (3-0-3) (S)

SOC 346,Population Dynamics
Considers the structure and organization of society as indicated by demographic characteristics such as births, deaths, marriage, and migration. Reviews the computation, analysis, and utilization of demographic techniques. (3-0-3) (S)

SOC 348,Deviant Behavior and Conformity
Analyzes the definition, development, and control of deviant behavior in relation to social processes. Societal reaction to and the amount, distribution, and behavior systems of various forms of deviance (drug addiction, suicide, crime, alcoholism, illegitimacy, etc.) are examined. (3-0-3) (S)

SOC 350 Urban Sociology
This three-part course investigates the role cities have played in the development of industrial societies; analyzes the historical development of American cities and the problems they face today, including poverty and racial tensions, fiscal strain, and population and industrial decline (with an emphasis on Chicago); and examines urban patterns and problems in the third world. (3-0-3) (S)

SOC 352,School and Society
Analyzes the organization and purpose of schooling in American society, including: the historical development of American education; the relationship of schooling to life chances and individual success; the bureaucratic characteristics of schooling; contemporary problems facing American education and proposals recommended for their solution; and how the U.S. educational system compares with those of other societies. (3-0-3) (S)

SOC 353,Women in Society
Examines the historical role and present status of women in the United States with respect to socialization, education, marriage and the family, legal discrimination, and the workforce, particularly the professions. Provides a cross-cultural comparison of women's roles in traditional and modern societies. (3-0-3) (S)

SOC 355,Political Sociology
Surveys major issues and problems in political sociology, including the forms of political power structures, elitist approaches to politics, community and national power structure, voting behavior, nation building and modernization, and civil-military relations. (3-0-3) (S)

SOC 362,Technology and Social Change
Examines major changes in social institutions and the role that technical innovations have played. Introduces the student to various approaches to assessment and forecasting. (3-0-3) (S)

SOC 371 Occupations and Professions
This course considers all factors affecting work, including the transition from school to work; the determinants of earnings and other job benefits; job satisfaction; labor unions and professional associations; class position in American society; the effects of foreign competition; government labor force policies; and the work environment in a comparative perspective. (3-0-3) (S)

SOC 374,Medical Sociology
Examines the social dimensions of patient and physician behavior, medical and nursing education, the organization of medical settings-particularly the hospital; social epidemiology; the politics of health care, unorthodox medicine, the delivery of services, and the systems of other nations. (3-0-3) (S)

SOC 401,Social Psychiatry
Examines social and cultural foundations of mental illness and its treatment. Topics include: social disorganization; the effects of urban living; the labeling process; ethnic and religious influences upon help-seeking behavior; and differences in treatment outcomes as a function of characteristics of mental health institutions, as well as therapeutic approaches and ideologies. (3-0-3) (S)

SOC 408,The Labor Force
Examines labor force surveys: their history; the different types which have developed; their validity, reliability, precision, and representativeness. Topics covered will include the measurement of employment and unemployment, development of the labor force concept, occupational and industrial classification, trends in the size and composition of the labor force. (3-0-3) (S)

SOC 411 The Social Use of Space
Explores the interaction of spatial and social dimensions of the city, including such topics as territoriality, neighboring, perceptions of community, effects of physical design and scale on human behavior, and urbanism and suburbanism as ways of life. Emphasizes case studies and direct observation of actual communities, with special attention to Chicago. (3-0-3) (S)

SOC 431 Development of Sociological Thought
Surveys ideas and issues that have influenced the history of sociology and continue to bear significantly on current theory. Analyzes major figures, schools of thought, conceptual themes, and controversies. (3-0-3) (S)

SOC 480 Sociology of Disability and Rehabilitation
Examines the institutions and groups that interact with disabled individuals. Topics include the service professions and rehabilitation; labeling and disability; sheltered care versus mainstreaming; disability and the family; the role of support groups; employment of individuals; and a cross-cultural survey of rehabilitation. (3-0-3) (S)

SOC 491,Undergraduate Research in Sociology
Students engage in supervised readings or research in order to obtain more intensive training in special interest areas of sociology. Prerequisite: Consent of instructor. (Credit: Variable)

SOC 497,Directed Readings
Students read selected literature on a particular topic. Prerequisite: Consent of instructor. (Credit: Variable) (S)

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Assistant Professor of Chemistry, 1992

John William Snapper B.A.,
Princeton University; M.A., Ph.D.,
University of Chicago Associate Professor of Philosophy and Associate Dean of Lewis College of Liberal Arts, 1979

Stephen D. Sowle B.A.,
Williams College; J.D.,
Yale Law School
Assistant Professor of Law, 1994

Michael Irwin Spak B.S., J.D.,
DePaul University; L.L.M.,
Northwestern University
Professor of Law, 1974

Harold Norman Spector B.S., M.S., Ph.D.,
University of Chicago
Professor of Physics, 1966

Alfred S. Spencer, Capt., U.S.A.F.*B.S.,
Baptist College at Charleston; M.A.,
Webster University
Assistant Professor of Aerospace Studies, 1992

Kenneth W. Stagliano B.A., Ph.D.,
Temple University
Assistant Professor of Chemistry, 1994

Benjamin C. Stark B.S.,
University of Michigan; M.Ph., Ph.D.,
Yale University Associate Professor of Biology, 1983

Henry Stark B.E.E.,
City College of New York; M.S.E.E., D. Eng. Sc.,
Columbia University
Carl and Paul Bodine Distinguished Professor of Electrical and Computer Engineering and Chairman of the Department, 1988

Ronald William Staudt B.S., B.A.,
St. Joseph College; J.D.,
University of Chicago
Professor of Law and Director of Computer Development, 1978

Joan Ellen Steinman A.B.,
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Harvard University
Professor of Law, 1977

Barbara A. Stetson B.A., M.S.,
San Diego State University; Ph.D.,
Vanderbilt University
Assistant Professor of Psychology, 1991

Margaret G. Stewart B.A.,
Kalamazoo College; J.D.,
Northwestern University

Professor of Law, 1977
Leon Eugene Stover B.A.,
Western Maryland College; M.A., Ph.D.,
Columbia University;
Litt. D. (Hon.), Western Maryland College
Professor of Anthropology, 1965
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Karen Straus B.A.,
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New York University School of Law
Visiting Assistant Professor of Law, 1993

Edwin F. Stueben B.S., M.S., Ph.D.,
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Professor of Mathematics and Vice President for Student Affairs, 1962

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Visiting Assistant Professor of Civil Engineering, 1989

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Distinguished Professor of Law, 1981

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David C. Thomas A.B.,
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Clinical Professor of Law, 1979

Paul Amandus Thomas B.S. Arch., M.S.
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Associate Professor of City and Regional Planning, 1958

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Professor of Management Sciences, 1966

Robert D. Throne B.S.,
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University of Michigan
Visiting Assistant Professor in the Pritzker Institute of Medical Engineering, 1990

Judith Ann Todd B.A., M.A., Ph.D.,
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Associate Professor of Metallurgical and Materials Engineering, 1990

Khairy Ahmed Tourk B.S.,
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Associate Professor of Economics, 1972

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Associate Professor of Electrical and Computer Engineering and Associate Chairman of the Department, 1987

David Venerus B.S.,
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Assistant Professor of Chemical Engineering, 1989

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Associate Professor of Law and Director of the Legal Information Center, 1990

Ujjval Vyas B.A.,
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Instructor in Architecture, 1993

Timothy R. Wagner B.S.,
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Visiting Assistant Professor of Chemistry, 1990

Mei Wang B.S., M.S.,
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Illinois Institute of Technology

Associate Professor of Mechanical and Aerospace Engineering, 1988

Richard Warner B.A.,
Stanford University; Ph.D.,
University of California (Berkeley); J.D.,
University of Southern California Law Center Assistant Professor of Law, 1990

Darsh Tilakschand Wasan B.S.,
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Professor of Chemical Engineering, Vice President, and Provost, 1964

John Lawrence Way B. Aero.E., M.S., Ph.D.,
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Professor of Mechanical and Aerospace Engineering, 1970

Erwin Wilbur Weber B.S., M.S., Ph.D.,
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Associate Professor of Electrical and Computer Engineering and Director of the Daniel F. and Ada L. Rice Campus, 1961

Dale Arroy Webster B.S.,
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Professor of Biology, 1968

Vivian M. Weil A.B., M.A.,
University of Chicago; Ph.D., University of Illinois Associate Professor of Ethics and Director of the Center for the Study of Ethics in the Professions, 1987

Miles N. Wernick B.A.,
Northwestern Univesity; Ph.D.,
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Assistant Professor of Electrical and Computer Engineering, 1994

Catherine Wetzel B.Arch.,
University of Cincinnati; M.Arch.,
University of Pennsylvania
Studio Professor of Architecture, 1989

Patrick F. Whitney B.F.A.,
University of Alberta (Canada); M.F.A.,
Cranbrook Academy of Art
Professor and Director of the Institute of Design, 1983
David R. Williams B.S.E.,
Stevens Institute of Technology; M.S.E., Ph.D.,
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Professor of Mechanical and Aerospace Engineering, 1983

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Assistant Professor of Electrical and Computer Engineering, 1989

Allen Harvey Wolach B.S.,
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Roosevelt University; Ph.D.,
University of New Mexico
Professor of Psychology, 1969

Jay Wolke B.F.A.,
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University of Hong Kong; M.S., Ph.D.,
Northwestern University Associate Professor of Electrical and Computer Engineering, 1981

Roland Wozniak A.A.,
Joliet Junior College; B.S.,
University of Illinois (Chicago)
Instructor in Physical Education, Intramural Director, and Assistant Baseball Coach, 1973

Richard W. Wright B.S
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Loyola University of Los Angeles;
L.L.M., Harvard University
Professor of Law, 1985

John F. Zasadzinski B.S.,
Illinois Benedictine College; Ph.D.,
Iowa State University Professor of Physics, 1982

David Zihlman B.A.,
University of Northern Colorado; M.F.A.,
Rhode Island School of Design
Visiting Assistant Professor in the Institute of Design, 1994

Emeriti Ralph Elmer Armington
Professor of Electrical Engineering, 1966–1982

Robert John Bonthron
Professor of Mechanical and Aerospace Engineering, 1947–1991

Harold Walter Bretz
Associate Professor of Microbiology, 1957–1986

Norman Nathan Breyer
Professor of Metallurgical and Materials Engineering, 1964–1991

Albert Joseph Brouse
Associate Professor of English, 1962–1987

Roland Anthony Budenholzer
John T. Rettaliata Institute Professor of Mechanical Engineering and Chairman of the American Power Conference, 1940–1978

Thomas Manuel Calero
Associate Professor of Management, 1968-1993

Kwang-Han Chu
Professor of Civil Engineering, 1956–1984

Martin Alvin Cohen
Associate Professor of Economics Management, 1964–1980

Martin Alvin Cohen
Associate Professor of Economics Management, 1964-1980

William White Colvert
Associate Professor of Physics and Dean of the Evening Division, 1919–1964

Alexander Cowie
Professor of Mechanical Engineering, 1938–1967

George Edson Danforth
Professor of Architecture, 1940–1981

William Frank Danforth
Professor of Physiology, 1952–1984

William Frank Darsow
Associate Professor of Mathematics, 1961–1990

Alva Leroy Davis
Professor of English and Linguistics, 1963–1980

Pearce Davis
Professor of Economics, 1948–1973

John DeCicco
Professor of Mathematics, 1962–1976

Ida Marie Didier
Associate Professor of Home Economics, 1944–1961

Lloyd Hamilton Donnell
Research Professor of Mechanics, 1939–1962

John Drac
Associate Professor of Law, 1957–1980

Paul Edward Fanta
Professor of Chemistry, 1948–1984

Andrew Akos Fejer
Professor of Mechanics and Mechanical and Aerospace Engineering, 1958–1978

Elmer Irving Fiesenheiser
Professor of Civil Engineering, 1943–1971

Robert Filler
Professor of Chemistry, 1955-1994

Nathan Goldman
Professor of Sociology, 1968–1973

Paul Gordon
Professor of Metallurgical Engineering, 1954–1982

Lois Graham
Professor of Mechanical Engineering, 1949–1985

Nicholas Grecz
Professor of Microbiology, 1963–1982

R. Ogden Hannaford
Professor of Architecture, 1960–1986

Boyd A. Hartley
Associate Professor of Fire Protection and Safety Engineering, 1966–1985

Isidore Hauser

Professor of Physics, 1958-1986

Teru Hayashi
Professor of Biology, 1967-1979

Warren Heindl
Professor of Law, 1949-1994

Fred F. Herzog
Professor of Law and Dean of Chicago-Kent College of Law, 1947-1973

Francis Clifford George Hoskin
Research Professor of Biology, 1969-1994

Frank Maria Hrachovsky
Associate Professor of Engineering Graphics, 1946-1973

Elton Wright Jones
Associate Professor of Electrical Engineering, 1948-1969

Henry Knepler
Professor of English, 1947-1989

Daniel Koblick
Associate Professor of Physiology, 1963-1991

Willis George Labes
Professor of Fire Protection Engineering, 1946-1979

Zalman Lavan
Professor of Mechanical and Aerospace Engineering, 1965-1991

Robert Olin Loving
Professor of Engineering Graphics, 1941-1980

Robert Joseph Malhiot
Professor of Physics, 1956-1987

Jordan J. Markham
Professor of Physics, 1962-1981

Thomas Lyle Martin, Jr.
Professor of Electrical Engineering and President, 1974-1987

Kenneth Phillip Milbradt
Associate Professor of Civil Engineering, 1946-1985

Sidney Israel Miller
Professor of Chemistry, 1951-1989

Mark Vladimir Morkovin
Professor of Mechanical Engineering, 1967-1982

Lester Charles Peach
Professor of Electrical and Computer Engineering, 1956-1987

H. Lennart Pearson
Associate Professor of Mathematics and Dean of Graduate Studies 1954-1994

Bernard Rasof
Professor of Mechanical Engineering, 1964-1982

Haim Reingold
Professor of Mathematics, 1943–1975

John Theodore Rettaliata
Professor of Mechanical Engineering and President Emeritus, 1945–1973

Frederick Ritter
Associate Professor of German, 1958–1968

Allan H. Roush
Professor of Biochemistry, 1951–1982

Fay Horton Sawyier
Associate Professor of Philosophy, 1975–1988

Phil Sheridan Schurrager
Professor of Psychology, 1946–1973

Marie Wilkinson Spencer
Assistant Professor of Economics, 1925–1958

Bernet Steven Swanson
Professor of Chemical Engineering, 1945–1985

T. Paul Torda
Professor of Mechanical Engineering and Director of the E3 Program Center, 1962–1977

Mary Ella Vermillion
Associate Professor of Psychology, 1959–1985

Edwin Robert Whitehead
Professor of Electrical Engineering, 1946–1972

Lee Roy Wilcox
Professor of Mathematics, 1940–1977

Stanton Edwin Winston
Professor of Mechanical Engineering and Dean of the Evening Division, 1919–1957

Scott Emerson Wood
Professor of Chemistry, 1948–1975

William F. Zacharias
Professor of Law and Dean of Chicago-Kent College of Law, 1933–1970

David Mordecai Zesmer
Professor of English, 1962–1992

Earl Frederick Zwicker
Professor of Physics, 1956–1991

University Memberships
Adult Education Association, Adult Education Council of Greater Chicago, American Assembly of Collegiate Schools of Business, American Association of Collegiate Registrars and Admissions Officers, American Association of University Women, American Council on Education, American Mathematical Society, American Power Conference, American Society for Engineering Education, American Society of Mechanical Engineers, Argonne Universities Association, Association for Computing Machinery, Association for Continuing Higher Education, Association of American Law Schools, Association of College and University Housing Officers, Association of College Unions International, Association of Collegiate Schools of Architecture, Association of Collegiate Schools

of Planning, Association of Governing Boards of Universities and Colleges, Association of NROTC Colleges, Association of Urban Universities, Central Association of College and University Business Officers, Chicago Association of Commerce and Industry, Chicago Convention and Tourism Bureau, Inc., College Art Association, College Scholarship Service, Commercial Club of Chicago, Council for Advancement and Support of Education, Council for Chemical Research, Council of Governmental Relations, Council of Graduate Schools in the United States, Council on Rehabilitation Education, EDUCOM, Federation of Independent Illinois Colleges and Universities, Greater Chicago Safety Council, Illinois Association of College Admissions Counselors, Illinois Association of College Stores, Illinois Society for Medical Research, Independent Schools Association of the Central States, Institute of International Education, Mathematical Association of America, Midwest College Placement Association, Midwest Universities Energy Consortium, Midwestern Association of Graduate Schools, National Association for Law Placement, National Association of College Admissions Counselors, National Association of College Stores, National Association of College and University Law Attorneys, National Association of College and University Business Officers, National Association of Educational Buyers, National Association of Foreign Student Affairs, National Association of Intercollegiate Athletics, National Association of Schools of Art, National Association of Student Personnel Administrators, National Commission for Cooperative Education, National Commission on Accrediting, National Conference on Power Transmission, National Fluid Power Association, North Central Association of Colleges and Schools, Rotary Club of Chicago, Southside Planning Board

UNIVERSITY COMMITTEES*

Academic Standing Committee
Chair: Daniel Waldstein

Accessibility for Persons with Disabilities Committee
Chair: Lynette D. Chappel

Administrative Council
Chair: Lewis Collens

Calendar and Catalog Committee
Chair: Sue C. Hardwidge

Campus Life Committee
Chair: Daniel Waldstein

Commencement Committee
Chair: Daniel Waldstein

Discipline Committee
Chair: Daniel Waldstein

EEO Affirmative Action and Diversity Committee
Chair:

Honorary Degrees Committee
Chair: Henry R. Linden

Research Council
Chair: Darsh T. Wasan

Senior Administrators' Council
Chair: Lewis Collens

Staff Advisory Council
Chair: Barbara Kozi

Student Information System Users Committee
Chair: Sue C. Hardwidge

* Membership is subject to change. For more information, please contact the committee chair.

FACULTY STANDING COMMITTEES*

Faculty Council
Chair: John R. O'Leary

Undergraduate Studies Committee
Chair: To be appointed

Graduate Studies Committee
Chair: Mohammad Shahidehpour

Academic Affairs Committee
Chair: Susan G. Feinberg

Sabbatical Leaves Committee

Chair: Dale Nance
Library Committee
Chair: Thomas C. Corke
Academic Computing Committee
Chair: George D. Kraft
Academic Freedom and Tenure Committee
Chair: Roya Ayman
Student Affairs Committee
Chair: Warren S. Schmaus
Academic Grievances Committee
Chair: Gary S. Laser
Financial Affairs Committee
Chair: Elwood T. Olsen
Nominations and Elections Committee
Chair: John R. O' Leary
Faculty Senate
Chair: Sidney A. Guralnick
* Membership is subject to change. For more information, please contact the committee chair.

TELEPHONE DIRECTORY

When calling from a campus phone use last five digits

Offices	Room/	Building	Area Code 312
Administrative And Service			
Academic Computing Center	Lower Level	SB	567-5962
Academic Services Division	102MB	567-3315	
Admission Office (Full-time Undergraduate)	101	PH	567-3025
Admission Office (Part-time Undergraduate)	101	MB	567-3300
Admissions Office (Graduate)			
Architecture and Planning		CR	567-5858
Engineering and ScienceConsult major department			
M.B.A., FM&T, Downtown Campus		(DT)	680 906-5140
Liberal Arts	185	LS	567-3151
Design	13th FloorII	TRI (RT)	808-5300
Public Administration		DT	906-5197
Alumni Relations	19th Floor	RT	3100
Athletics and Recreation		KH	567-3298
Bookstore		Commons	567-3120
Bursar's Office	207	MB	567-3320
Business Manager	205	MB	567-3327
Campus Police Department		FH	808-6300
Career Development	404	FH	808-7100
Cooperative Education Office	301	FH	808-7110
Chaplain		HH	567-3080
Counseling and Health Service	103	FH	808-7100
Dean of Students	HH		567-3080
Disability Resources	218	LS	567-5744
Educational Services Office	101	MB	567-3300
Graduate Records Office	301	MB	567-6887
Housing		Commons	567-5075
IITV	226	SB	567-3460
International Students and Scholar Center	401	FH	808-7105
Library(Galvin)		LB	567-6844
Orientation (New Students)		HH	567-3080
Public RelationsCommons			567-3104
Daniel F. and Ada L. Rice Campus,201 E. Lop Road, Wheaton			(708)682-6000
Student Finance Center	212	MB	567-3303
Student Loan Office	204	MB	567-5952
Student Records & Registration	104	MB	567-3310
Tuition Accounting	207	MB	567-3039
Colleges And Academic Departments			
College of Architecture		CR	567-3230
Architecture		CR	567-3262
City and Regional Planning		CR	567-3261
College of Engineering and Science, Armour	117	E1	567-3009
Air Force Aerospace Studies		SB	567-3525
Chemical & Biological Sciences	122	WH	567-3425
Chemical Engineering	124	PH	567-3040
Civil Engineering 2	28	AM	567-3540
Computer Science	236	BSB	567-5150
Electrical and Computer Engineering	132	SH	567-3400
Engineering Graphics	405	MB	567-3365
Environmental Engineering	103	AM	567-3536
Mathematics	208	E1	567-3162
Mechanical and Aerospace Engineering	243	E1	567-3175
Metallurgical and Materials Engineering	205	PH	567-3050
Military Science		SB	567-7553
Naval Science		SB	567-3529
Physics	106	SH	567-3375

College of Law, Chicago-Kent		DT	906-5000
College of Liberal Arts, Lewis	182	LS	567-3007
Humanities	106	LS	567-3465
Psychology	252	LS	567-3500
Social Sciences	232	BLS	567-5129
Graduate School	301	MB	567-3024
Institute of Design		RT	808-5300
School of Business, Stuart	103	CSB	567- 5120

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